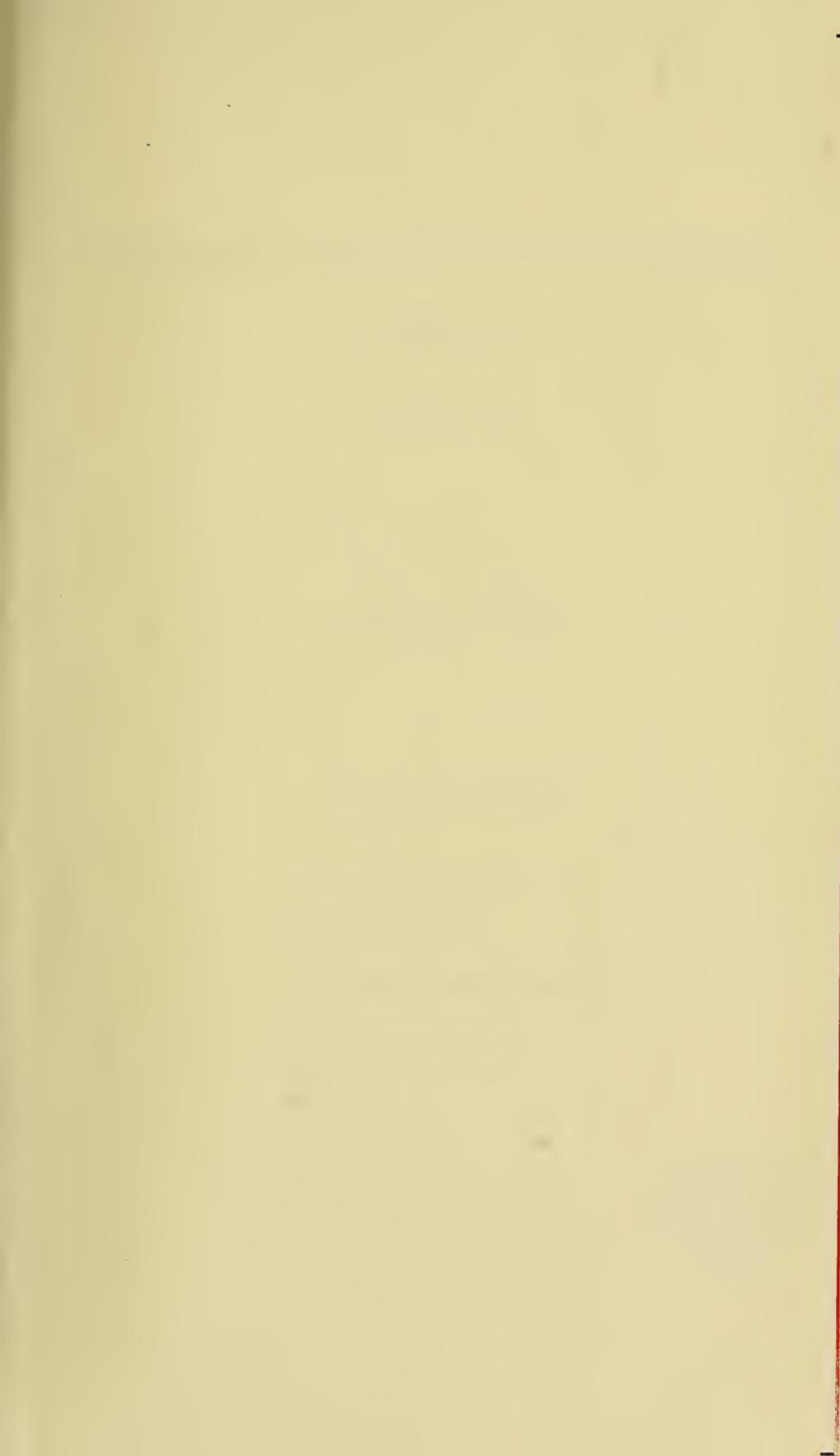




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1974-1975

Volume 2

Lincoln College

University College

Graduate Schools

Arts and Sciences

Boston-Bouvé

Business Administration

Criminal Justice

Education

Engineering

Pharmacy



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bulletin

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northeastern university bulletin

Day and Evening Programs in:
aviation technology
engineering technology
science technology

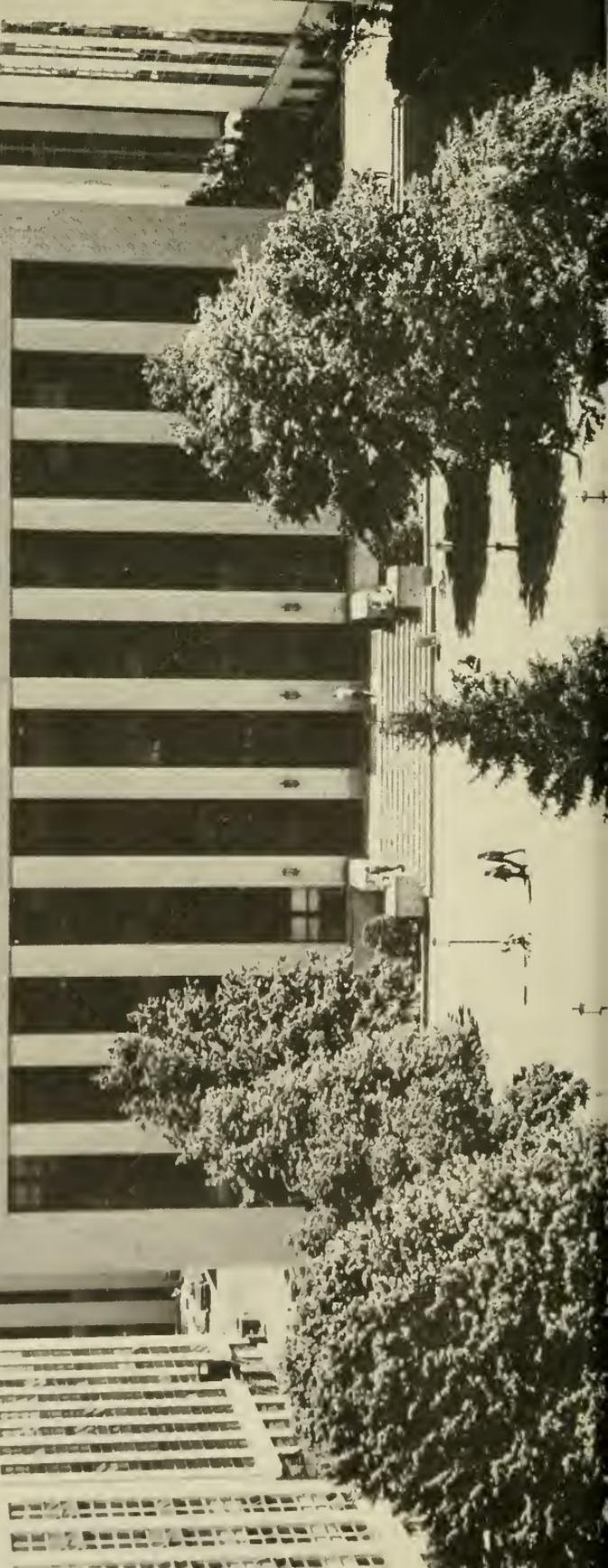


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Lincoln College 1974-75

NORTHEASTERN UNIVERSITY

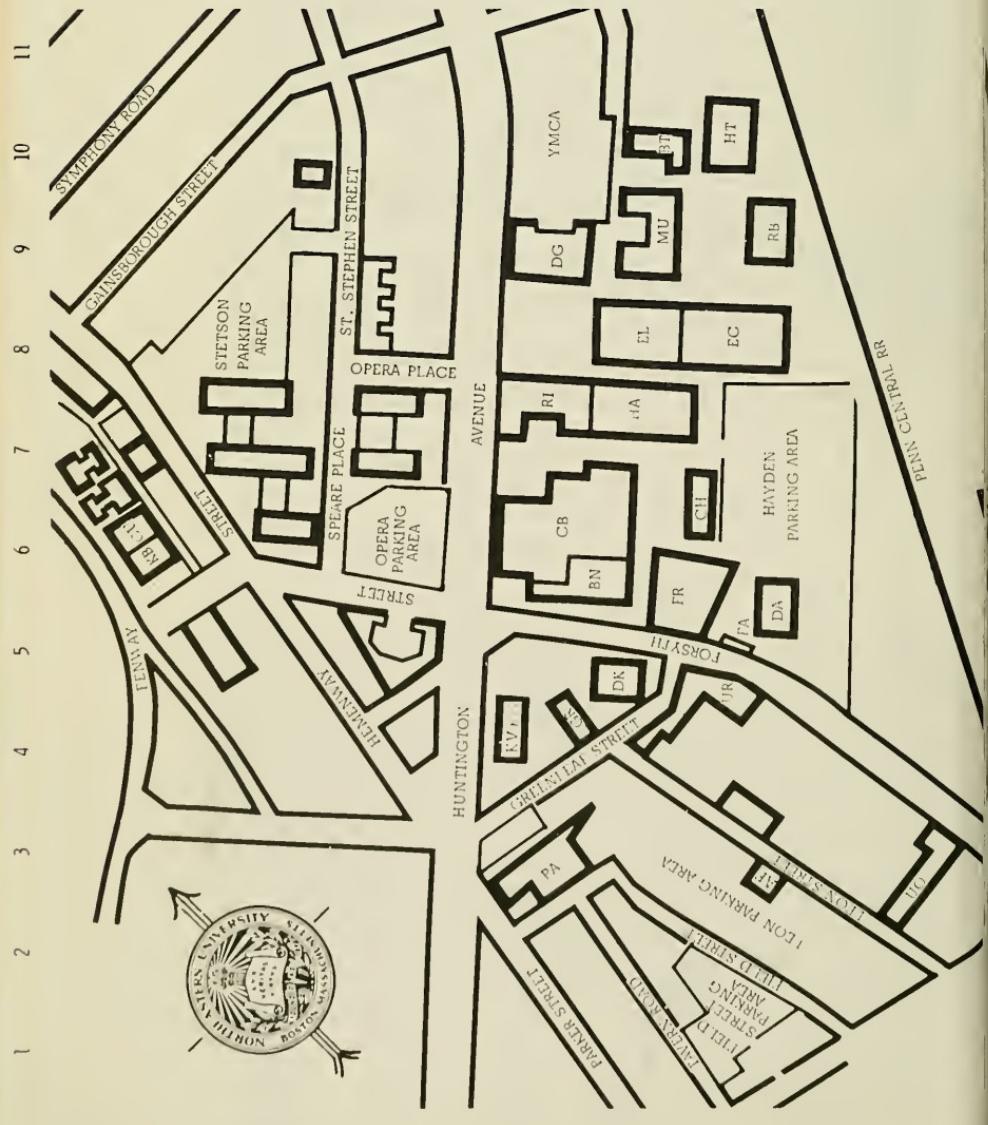


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Building Designation	Building	REFERENCE
BN	Barletta Natatorium	F6
BT	Botolph Building	F10
CB	Cabot Physical Education Ctr.	E6
CH	Churchill Hall	G7
CU	Cushing Hall	A6
DA	Dana Research Center	H6
DK	Dockser Hall	F5
DG	Dodge Library	E9
EC	Ell Student Center and Alumni Auditorium	G8
EL	Forsyth Building	F8
FR	Forsyth Building Annex	G6
FA	Greenleaf Building	G5
GR	Hayden Hall	F4
HA	Hurtig Hall	F7
HT	Kennedy Building	G10
KB	Knowles Center (Volpe)	B6
KV	Knowles Center (Gryzmish)	E4
KG	11 Leon Street	J3
UO	Afro-American Institute	H3
AF	Mugar Life Sciences Building	F9
MU	Parker Building	F3
PA	Richards Hall	E7
RI	Robinson Hall	H9
RB	United Realty Building	G5



Office Hours at Huntington Avenue Campus, Boston

June 24, 1974 — September 3, 1974

Monday-Thursday	8:30 A.M.-8:30 P.M.
Friday	8:30 A.M.-4:30 P.M.

September 3, 1974 — June 13, 1975

Monday-Friday	8:30 A.M.-8:30 P.M.
---------------------	---------------------

Program Counseling at Suburban Campus, Burlington

Representatives from the Huntington Avenue Campus will be in attendance during specified dates for guidance and counseling. The bookstore and the Bursar's Office are open from 8:30 a.m.-8:30 p.m., Monday-Friday, and 8:30 a.m.-12:00 p.m., Saturday.

Program Counseling at Extensions

Program counselors are available on a regular schedule at Lincoln College extensions at: the Wyman Junior High School, Burlington; the North High School, Framingham; the North High School, Weymouth; the English High School, Lynn; the Junior High School North, Norwood; and the Norwood Airport, Norwood. Appointments may be arranged by telephoning the Lincoln College office at 437-2500.

Interviews

Prospective students, or those desiring advice or guidance regarding any part of the school work or curricula, are encouraged to arrange for personal interviews. Career planning through competent guidance provides an understanding of professional requirements and develops that definiteness of purpose so vital to success. Lincoln College Office is located at 219 Hayden Hall at the Boston Campus.

Address communications to:

William F. King, Director
Lincoln College
Northeastern University
360 Huntington Avenue
Boston, Massachusetts 02115
Telephone 437-2500

1974-1975 ACADEMIC CALENDAR

Fall Quarter 1974

Classes Begin Monday, September 30, 1974

FALL REGISTRATION DATES

Boston	5:30-8:30 p.m.	Monday-Friday, September 16-20
Boston	9:00 a.m.-12 noon	Saturday, September 21
Boston	5:30-8:30 p.m.	Monday-Thursday, September 23-26
Burlington	5:30-8:30 p.m.	Monday-Thursday, September 23-26
	12 noon-8:30 p.m.	Tuesday, September 17
Boxford (Masconomet Regional)		
Framingham North H. S.	5:30-8:30 p.m.	Tuesday, September 17 and Monday, September 23
Haverhill H. S.		
Lynn English H. S.		
Weymouth North H. S.		
Norwood Jr. H. S. North		
Milford H. S.	5:30-8:30 p.m.	Monday, September 16, and Monday, September 23
Classes begin		September 30
Columbus Day Observed	No Classes	Monday, October 14
Veterans Day Observed	No Classes	Monday, October 28
Thanksgiving Recess	No Classes	Thursday-Saturday, November 28-30
Final Examination Period For Fall Quarter		Monday, December 16- Saturday, December 21

Winter Quarter 1974-1975

Classes Begin Wednesday, January 6, 1975

WINTER REGISTRATION DATES

Boston	5:30-8:30 p.m.	Monday-Friday, December 16-20
Boxford (Masconomet)	5:30-8:30 p.m.	Tuesday and Thursday, December 17 and 19
Burlington	5:30-8:30 p.m.	Monday-Thursday, December 16-19
Framingham North H. S.	5:30-8:30 p.m.	Monday-Thursday, December 16-19
Haverhill H. S.	5:30-8:30 p.m.	Monday and Tuesday, December 16-17
Lynn English H. S.	5:30-8:30 p.m.	Monday and Wednesday, December 16 and 18
Milford H. S.	5:30-8:30 p.m.	Monday and Tuesday, December 16 and 17
Norwood Jr. H. S. North	5:30-8:30 p.m.	Monday and Tuesday, December 16-17
Weymouth North H. S.	5:30-8:30 p.m.	Monday-Thursday, December 16-19
Christmas Vacation	No Classes	Monday, December 23- Saturday, January 4
Winter Quarter Classes Begin Washington's Birthday Observed	No Classes	Wednesday, January 6 Monday, February 17
Final Examination Period for Winter Quarter		Monday, March 24- Saturday, March 29

Spring Quarter 1975

Classes Begin Monday, April 7, 1975

SPRING REGISTRATION DATES

Boston	5:30-8:30 p.m.	Monday-Friday, March 24-28
Boxford (Masconomet)	5:30-8:30 p.m.	Tuesday and Thursday, March 25 and 27
Burlington	5:30-8:30 p.m.	Monday-Thursday, March 24-27
Framingham North H. S.	5:30-8:30 p.m.	Monday-Thursday, March 24-27
Haverhill H. S.	5:30-8:30 p.m.	Monday and Tuesday, March 24 and 25
Lynn English H. S.	5:30-8:30 p.m.	Monday and Wednesday, March 24 and 26
Milford H. S.	5:30-8:30 p.m.	Monday and Tuesday, March 24 and 25
Norwood Jr. H. S. North	5:30-8:30 p.m.	Monday and Tuesday, March 24 and 25
Weymouth North H. S.	5:30-8:30 p.m.	Monday-Thursday, March 24-27
Spring Recess* (Or Make Up Period for Lost Snow Days)		Monday, March 31- Saturday, April 5
Spring Quarter Begins		Monday, April 7
Patriot's Day Observed	No Classes	Monday, April 21
Memorial Day Observed	No Classes	Monday, May 26
Final Examination Period for Spring Quarter		Tuesday, June 17- Monday, June 23
Commencement		Sunday, June 22

Summer Quarter 1975

Classes Begin Monday, June 30, 1975

REGISTRATION FOR ENTIRE SUMMER QUARTER

Boston	5:30-8:30 p.m.	Monday-Friday, June 16-20
Burlington	12 noon-8:30 p.m.	Tuesday, June 17
Classes Begin		Monday, June 30

Registration for Second Six Week Term

Boston	5:30-8:30 p.m.	Monday and Tuesday, August 4 and 5
Burlington	5:30-8:30 p.m.	Monday, August 4
Independence Day Observed	No Classes	Thursday, July 4
Labor Day Observed	No Classes	Monday, September 1
Final Examination Period for Summer Quarter		Monday, September 15- Thursday, Sept. 18

Equal Opportunity Policy

Northeastern University is committed to a policy of providing equal opportunity for all. In all matters involving admission, registration, and all official relationships with students, including evaluation of academic performance, the University insists on a policy of nondiscrimination. Northeastern University is also an equal opportunity employer; it is institutional policy that there shall not be any discrimination against any employee or applicant for employment because of race, color, religion, sex, age, or national origin.

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or
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the university

Founded in 1898, Northeastern University is incorporated as a privately endowed, nonsectarian institution of higher learning under the General Laws of Massachusetts. The State Legislature by special enactment has given the University general degree-granting powers. The University is governed by a Board of Trustees elected by and from the Northeastern University Corporation, which is composed of more than 150 distinguished business and professional men and women.

From its beginning Northeastern University has had as its dominant purpose the discovery of community educational needs and the meeting of these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Cooperative Plan, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922), Liberal Arts (1935), Education (1953), Pharmacy (1962), Nursing (1964), Boston-Bouvé College (1964), the College of Criminal Justice (1967), and by Lincoln College's Engineering Technology Programs (1971). This educational method enables students to gain valuable practical experience as an integral part of their college programs and also provides the means by which they may contribute substantially to the financing of their education. The Plan has been extended to the graduate level in engineering, mathematics, actuarial science, rehabilitation administration, professional accounting, business administration, and law.

In the field of adult education, programs of study have been developed to meet a variety of needs. Since 1906 evening curricula have been offered leading to the bachelor's degree. Programs in the arts and sciences, engineering, various fields of business, law enforcement and security, and other areas have been carefully planned to serve mature students who are employed full time during the day and want to broaden their educational background by part-time study. All formal courses of study leading to degrees through evening programs are approved by the Basic College faculties concerned and are subject to the same quantitative and qualitative standards as the regular day curricula.

UNDERGRADUATE COLLEGES

Boston-Bouvé College

Boston-Bouvé College offers four major programs of study: physical education, recreation education, and health education, both leading to the degree of Bachelor of Science in Education; and physical therapy, leading to the degree of Bachelor of Science in Physical Therapy.

The combined programs of liberal arts, science, and professional preparation include field experience and student teaching, and leadership training in camping and outdoor education at the Warren Center for Physical Education and Recreation in Ashland. In accordance with Northeastern's Cooperative Plan of Education, students are offered varied opportunities for alternate terms of work-study experience during upper-class years.

The College of Business Administration

The College of Business Administration offers programs of study in the principal fields of business leading to the degree of Bachelor of Science in Business Administration. These programs are offered on the five-year Cooperative Plan, under which students gain substantial practical experience in the fields for which they are preparing as an integral part of their undergraduate course of study.

The College also sponsors a Management Institute which offers various special courses for business and industrial executives. One phase of the Institute's work is carried on by the Center for Management Development, which annually conducts an intensive program designed to provide professional growth for middle-management executives who will ultimately be called upon to carry broader executive responsibilities. The plan of instruction, based on a modification of the Northeastern Cooperative Program, permits the participants to maintain their job responsibilities during the six-month period of the course. The Management Development Program is conducted at Andover, Massachusetts, on the campus of Andover Academy.

College of Criminal Justice

The College of Criminal Justice offers full-time day curricula on the Cooperative Plan leading to the degree of Bachelor of Science.

The College of Education

The College of Education offers programs leading to the degree of Bachelor of Science in Education. These are designed particularly to meet the needs of high school graduates who desire to prepare themselves for teaching or administrative positions in elementary and secondary schools. Curricula are offered on the five-year Cooperative Plan, which provides for employment in libraries, social service agencies, and school systems.

The College of Engineering

The College of Engineering offers five-year cooperative curricula in civil, mechanical, electrical, chemical, and industrial engineering leading to the degree of Bachelor of Science with specification according to the engineering department in which the student qualifies. The College also offers a general engineering program awarding an unspecified Bachelor of Science degree where the student has the opportunity to design his own program with his career objectives in mind. A six-year program in power systems engineering in collaboration with public utilities leads to both the bachelor's and master's degree in electrical engineering. During evening hours are part-time programs leading to the Bachelor of Science degrees in Electrical Engineering and Civil Engineering. These programs extend over eight years, cover the identical courses given in the day cooperative curriculum, and meet the same qualitative and quantitative standards of scholarship.

The College of Liberal Arts

The College of Liberal Arts offers majors in the arts and sciences leading to the degree of Bachelor of Arts. With the exception of preprofessional programs, curricula are normally five years in length and operate on the Cooperative Plan.

Lincoln College

Lincoln College offers engineering technology programs leading to the Associate in Engineering, the Associate in Science, and the Bachelor of Engineering Technology degrees. These programs are made available as:

- (a) A full-time day curricula on the Cooperative Plan leading to the degree of Bachelor of Engineering Technology (B.E.T.) in Mechanical or Electrical Engineering.
- (b) A part-time evening program including pretechnology preparatory courses and degree programs leading to the Associate in Engineering (A.E.); and the Bachelor of Engineering Technology (B.E.T.) in Civil, Mechanical, or Electrical Engineering. The Associate in Science degree may be earned in the Mathematical, Physical, and Chemical Sciences.
- (c) Lincoln College part-time students whose work schedule does not permit them to attend regular evening classes may register for a maximum of 8 quarter hours of course work per quarter in the Lincoln College Day Program.

Registration materials will be available Monday through Friday in Room 219 Hayden Hall, Boston Campus only, during the week preceding the start of each quarter. The day class schedule will not be available at other campus locations. The Registrar

will not accept registration materials for day classes without the approval of the Director of Lincoln College. Tuition will be billed at normal evening part-time rates.

Interested students should consult course listing (page 153) to determine equivalent day courses.

The day B.E.T. program is designed to meet the needs of the high school graduate or the student transferring from a community college or technical institute and who desires the full time day curricula on the Northeastern Cooperative Plan.

In addition to its traditional curricula, Lincoln College Evening School offers interdisciplinary and certificate programs providing technological and professional development opportunities to meet special needs of the part-time student. These programs are designed to provide trained people for ready assimilation by the engineering field and to prepare students for the challenge of interfacing technology and society.

Recognizing the increasing need for higher levels of technical efficiency in fire investigation, fire prevention, and fire protection, Lincoln College, in collaboration with local firefighting agencies, has designed a part-time evening program leading to an Associate in Science degree in Fire Technology. The curriculum includes a broad spectrum of those science technologies which are basic in coping with the firefighting problems attendant to the complexities of today's society.

The College of Nursing

The College of Nursing offers two separate and distinct programs of study, both organized on the Cooperative Plan:

- (a) A three-year curriculum in preparation for the R.N. Examinations leading to the Associate in Science degree.
- (b) A five-year curriculum also preparing students for the R.N. Examinations, and leading to the degree of Bachelor of Science in Nursing.

Five of Boston's leading hospitals — Beth Israel, Children's Hospital Medical Center, New England Deaconess, Peter Bent Brigham, and Massachusetts General — collaborate with Northeastern by providing suitable cooperative work opportunities during the upper-class years of these programs.

The College of Pharmacy and Allied Health Professions

The College of Pharmacy and Allied Health Professions offers five-year cooperative curricula leading to the degree of Bachelor of Science in Pharmacy, and to the Bachelor of Science degree with majors in medical laboratory science (medical technology; cytotechnology, hematology), medical record administration, and management in health care agencies and institutions. Associate degree programs are offered in medical laboratory science, respiratory therapy, dental hygiene, and cytotechnology. The

College has academic responsibility and, in cooperation with the medical schools and teaching hospitals in the Boston area, offers the professional program for physician assistants.

University College

University College, so called because it draws upon the resources of the other colleges of the University, offers part-time programs in Liberal Arts, Business Administration, Law Enforcement, Education, and Health, leading to the Associate in Science, Bachelor of Arts, and Bachelor of Science degrees. It does not duplicate the offerings of the day college, but provides curricula which cut across traditional subject-matter areas to meet the particular needs of adult students. Students may pursue a degree or simply take courses, based on needs and interests, up to a total of forty quarter hours of credit. Courses are offered in Boston as well as at Boxford, Burlington, Framingham, Lynn, Haverhill, Milford, Weymouth, and several other convenient locations.

Adult Day Programs refers to University College courses that are offered Monday through Friday, 9:00 a.m. to 5:00 p.m., to meet the needs of adults with family or other obligations who wish to engage in part-time study during the day. In addition to the daytime offering of regular University College credit courses, Adult Day Programs also offers daytime workshops and conferences, sometimes over weekends, with the option for credit. Adult Day Programs are offered primarily on the Boston and Burlington campuses, with a limited number of courses offered at other off-campus locations.

Students may enroll as degree candidates or elect single courses appropriate to their needs and interests. Courses are scheduled in the day and evening at the Boston Campus, Suburban Campus in Burlington, and other off-campus locations near Boston.

GRADUATE SCHOOLS

Actuarial Science

Master of Science in Actuarial Science.

Arts and Sciences

The Master of Arts degree may be earned in economics, English, history, political science, psychology, sociology, and social anthropology. The Master of Science degree is available in biology, chemistry, mathematics, and physics. The Master of Science in Health Science and the Master of Public Administration degrees are also offered. In addition, there are programs leading to the Doctor of Philosophy degree in biology, chemistry, economics, mathematics, physics, psychology, and sociology.

Boston-Bouvé College

Master of Science in Physical Education and Master of Science in recreation Education.

Business Administration

Master of Business Administration.

Criminal Justice

Master of Science in Criminal Justice.

Education

Master of Education, and the Certificate of Advanced Graduate Study.

Engineering

Master of Science with course specification, including a special six-year program in Power Systems Engineering leading to both bachelor's and master's degrees in Electrical Engineering; a similar six-year program in Mechanical Engineering leading to both bachelor's and master's degrees; the Master of Science degree in Civil Engineering; master's degrees in the fields of Industrial Engineering and Engineering Management; the professional Engineer degree in Electrical Engineering; the Doctor of Engineering degree in Chemical Engineering; and the Ph.D. degree in the fields of Electrical, Chemical, Civil, and Mechanical Engineering. In addition, the intermediate degree of Engineer is offered.

Law

The School of Law offers a full-time program of professional instruction leading to the degree of Juris Doctor (J.D.). The three-year curriculum includes twelve months of experience in law offices. There are no courses for part-time or evening students.

Pharmacy and Allied Health Professions

Master of Science with specialization in Hospital Pharmacy, Industrial Pharmacy, Medical Chemistry, Pharmacology, Medical Laboratory Science, and Doctor of Philosophy in Medical Chemistry.

Professional Accounting

A five-quarter curriculum leading to the degree of Master of Science in Accounting.

Some of these programs are offered on the Cooperative Plan; others provide teaching and research fellowships for able candidates. The graduate schools are under the jurisdiction of the basic college deans.

CENTER FOR CONTINUING EDUCATION

The Center for Continuing Education was established to relate the University to the needs of its community in a period of accelerated change. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. The Division of Special Programs, working cooperatively with trade associations

and professional societies, offers a wide variety of programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

OFFICE OF EDUCATIONAL RESOURCES

The Office of Educational Resources exists to provide (1) facilities and services that enhance student learning, (2) instructional services and equipment that assist faculty in providing efficient and effective instruction, and (3) research and development directed toward the ultimate implementation of empirically tested instructional systems and innovations. The Instructional Systems Analysis Group, a Special Projects Group, and three divisions—Programmed Learning, Instructional Media, Instructional Communications — carry out the objectives. Of particular student interest is the Center for Programmed Study located in 211 Dodge. There, students study courses taught via self-instructional programs, use programs to supplement course work, fulfill course prerequisite requirements, pursue remedial or review knowledge, or study just for fun. Each student's activity and progress is constantly monitored; faculty assist when content problems arise. Also of note is the Instructional Materials Information Center which provides a central facility and clearinghouse concerning state-of-the-art information on educational technology and innovations; and houses instructional materials from preschool through graduate levels such as texts, programs, activity boxes, slides, filmstrips, illustrations, motion pictures, laboratory kits, simulations, models, video and audio tapes, teacher's manuals, curriculum guides, research reports, standardized tests and other instructional support materials.

DAY PROGRAMS FOR ADULTS

These programs were developed to meet the needs of adults who wish to engage in part-time study during the day only. Non-credit courses and undergraduate and graduate degree programs are offered at the Boston and Burlington campuses. Included are courses from the Graduate School of Education, the Graduate School of Arts and Sciences, University College, and the Center for Continuing Education. A Human Relations and Adult Counseling Program is also offered.

AFFILIATED PROGRAMS

For Dental Hygienists

The Forsyth School for Dental Hygienists conducts a two-year program of dental hygiene education and general education in cooperation with

Northeastern University. Graduates of the program receive the Certificate in Dental Hygiene from Forsyth and the degree of Associate in Science from Northeastern University. After receiving the Associate degree, students may pursue the Bachelor of Science degree from University College on a part-time basis.

Aviation Technology

Lincoln College, in collaboration with Wiggins Airways, Inc., conducts full-time day programs in Aviation Technology in which the student earns the Associate in Science degree and may become licensed by the Federal Aviation Administration with commercial, instrument, and instructors pilot ratings.

Medical Record Science

The University, in affiliation with several area hospitals, offers a three-year program leading to certification in Medical Records Science for students who already hold a bachelor's degree and wish to qualify for the professional examination leading to registration as a record librarian.

For Medical Technologists, Cytotechnologists, Hematologists

In cooperation with the New England Baptist and the New England Deaconess Hospitals, Northeastern University offers a full-time day program on the Cooperative Plan leading to the degree of Bachelor of Science.

Bachelor of Science degree programs in Medical Technology, Cytotechnology, and Hematology are offered on a part-time basis by University College in cooperation with several approved hospital schools.

For Nurses

Northeastern University offers instruction in the sciences, humanities, and social studies for student nurses from the New England Deaconess and Children's Hospital Medical Center Schools of Nursing.

Physician Assistant

In cooperation with the Massachusetts Medical Society, Northeastern offers an 18-month program for the primary care physician assistant. Clinical rotations, supplemental to courses taken on campus, take place at Boston-area hospitals.

For Radiologic Technologists

University College in collaboration with over 50 A.M.A. accredited Hospital Schools of Radiologic Technology located in the New England area conducts a program leading to certification as a registered Radiologic Technologist (R.T.) and the Associate in Science degree.

For Respiratory Therapists

This program is conducted by University College and the College of Pharmacy and Allied Health Professions in affiliation with local hospitals.

buildings and facilities

Location of Main Campus

The main campus of Northeastern University is located at 360 Huntington Avenue in the Back Bay section of Boston. Many of the city's famous cultural, educational, and philanthropic institutions are situated in the Back Bay, including the Museum of Fine Arts, Symphony Hall, Horticultural Hall, the Isabella Stewart Gardner Museum, the Harvard teaching hospitals, and many schools and colleges. Most are within walking distance of Northeastern University.

Major transportation facilities serving the Boston area are Logan International Airport, two rail terminals, bus terminals serving inter- and intra-state lines, and MBTA subway-bus service within the metropolitan-suburban area. There is a subway stop in front of the campus. For motorists, the best routes to the campus are the Massachusetts Turnpike (Exit 22) and Route 9, of which Huntington Avenue is the intown section.

The campus of 47 acres is divided by Huntington Avenue, with the main educational buildings on one side and dormitories on the other. The principal buildings, all of which have been constructed since 1938, are of glazed brick in contemporary classic style. Most are interconnected by underground passageways.

Carl S. Ell Student Center

The Carl S. Ell Student Center provides facilities for student recreation and for extracurricular activities. The Alumni Auditorium, with a seating capacity of 1,300, is part of the Center. Also included are special drama facilities, a ballroom, main lounge, fine arts exhibition area, student offices, conference rooms, and a dining area seating more than 1,000.

The University Library

The Dodge Library is the main library on the Boston campus and maintains an open-stack system. Bound volumes in the library system exceed 360,000, and microform titles, 267,000. Collections are located in these areas:

1. The General Collection in the book stacks as indicated by the classification number given in the upper left corner of the catalog card.

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2. The Reference Collection in the Cabot Reading Room to the left of the circulation desk, which includes bibliographies, maps, company publications, the pamphlet file, and association publications. Theses, under the supervision of the Reference Dept., housed in the basement and should be requested in the Reference Room.
3. The Periodical Collection in the Webster Reading Room to the right of the circulation desk, consisting of current periodicals, periodical indexes and abstracts, with 2 stack levels adjacent for back files of bound volumes. The Microfilm Collection in Room 108, adjacent to the Webster Reading Room.
4. The Reserve Book Collection on the second floor.
5. The Foreign Literature Collections in the Webster Reading Room to the right of the circulation desk.
6. The collections of fine arts, housed in the Richardson Room on the second floor. The audio facility for spoken and music recordings and magnetic tapes for instructional and individual use also located in this room.
7. The American and English Literature Collections in the Literature Reading Room.
8. Government documents maintained on the basement level.

There are also book catalogs of the collections in the library at Norwood Airport, Math/Psych Library, Chemistry Library, and in both the Documents and Reserve Book Rooms. There is an information desk in the Reserve Book Room to assist people in using the card catalog during the day.

The Circulation Dept. has a printed list of all materials charged out, which may be consulted by all users. To borrow materials, University identification must be presented. For extensive research, where the University Library does not have the material, application should be made to the Inter-Library Loan Librarian for materials needed from other libraries. Information service is available in this department in the evenings.

Library Hours — Boston Campus

Monday — Thursday	7:45 a.m. to 10:00 p.m.
Friday	7:45 a.m. to 7:30 p.m.
Saturday & Sunday	1:00 p.m. to 5:00 p.m.

The University Library System includes three graduate libraries in the Division of Research. Physics-electrical engineering is housed in 325 Dana Research Center. Mathematics-psychology is housed on the fifth floor of the United Realty Building and chemistry is located on the first floor of Hurtig Hall.

Library Hours — Suburban Campus, Burlington

Monday — Friday 8:30 a.m. to 9:00 p.m.

Cabot Physical Education Center

The Godfrey Lowell Cabot Physical Education Center is one of the best equipped in New England. It contains four basketball courts, an athletic cage, a women's gymnasium, and a rifle range, as well as administrative offices for the Department of Athletics and for the Physical Education Department of Boston-Bouvé College.

A recent addition to the center, the Barletta Natatorium, houses a 105-foot swimming pool, a practice tank for the crew, handball courts, and shower and dressing facilities.

Dockser Hall

Charles and Estelle Dockser Hall, completed in 1968, houses a large gymnasium, dance studio, motor performance laboratory, college library, community recreation laboratory, folk arts center, dark and music rooms, recreation resources area, locker rooms, offices, classrooms, conference room and lounge, storage facilities, and a research laboratory.

SUBURBAN FACILITIES

Suburban Campus

The Suburban Campus, located near the junction of Routes 128 and 3 in Burlington, Massachusetts, was established to meet the needs of individuals and of industry in the area.

In addition to graduate courses in engineering, physics, mathematics, business administration, science; education, and the arts, portions of undergraduate programs leading to the associate and bachelor's degrees, special programs for adults, and non-credit state-of-the-art programs are offered.

Henderson House

The University's conference center, Henderson House, is located in Weston, Massachusetts. The Center for Continuing Education conducts short-term courses, seminars, and special institutes for business, professional, and research groups. Henderson House is 12 miles from the main campus.

Warren Center

The Warren Center for Physical Education and Recreation in Ashland, Massachusetts, serves as a year-round outdoor laboratory for students in Boston-Bouvé College. There are facilities for conferences, special education in arts and crafts, and sports — including aquatics. Buildings include a lodge, cottages, and an infirmary.

Marine Science Institute

The Marine Science Institute at Nahant, Massachusetts, about 20 miles northeast of Boston, is a research and instruction facility primarily engaged in studies of marine biology and oceanography. The Institute is operated the year around.

lincoln college administration

Administrative Officers

William F. King, B.S., M.S., P.E.
Director

Jacob WIREN, B.S., M.S., P.E. Hollis S. BAIRD
Assistant Director Assistant to the Director
Otis F. CUSHMAN, B.S., M.S.
Assistant Director

Student Counselling Staff

Hollis S. Baird
Administrative Coordinator

Robert J. Averill, B.S., M.S.
Philip W. Dunphy, B.S., M.Ed.
Charles F. Field, B.S., M.Ed.
George K. Howe, B.S., M.Ed.
Philip R. McCabe, B.S., Ed.M.
Roderic W. Sommers, B.S., M.Ed.
Richard E. Sprague, B.S., B.B.A.,
M.B.A., Ed.M.
Jacob Wiren, B.S., M.S., P.E.
Kenneth S. Woodward, B.S., M.S.

Committee on Regulations and Discipline

William F. King, Chairman

Academic Standing Committee

Otis F. Cushman, *Chairman*

Academic Advisory Council

William F. King, Chairman

Jacob Wiren, Vice Chairman

Hollis S. Baird, Secretary

Curriculum Advisory Committee

William F. King, B.S., M.S., P.E.
(Academic Administration)

Chairman
Jacob Wiren, B.S., M.S., P.E.

Vice Chairman
Otis F. Cushman, B.S., M.S.

Secretary
Professor Hollis S. Baird

Robert J. Averill, B.S., M.S. (Circuit Theory)	John Kaczorowski, Jr., B.S., M.S. (Electrical Power Engineering Technology)
Edward Bobroff, B.M.E., P.E. (Mass) (Calculus)	Gary M. Keighley, B.S. (Flight School)
Eugene G. Branca, S.B., S.M. (Basic Mathematics)	George F. Kent, B.S., M.S., P.E. (Mass) (Materials)
Franklyn K. Brown, B.S., Ed.M. (Engineering Design)	Horatio W. Lamson, B.S., M.A., P.E. (Mass) (Electrical Measurements)
William O. Bruehl (Mechanical Engineering Laboratory)	Robert S. Lang, B.S., Ed.M. (Graphics and Computation)
Leroy M. Cahoon, B.S. in C.E., M.S., P.E. (Mass) (Civil Engineering Technology)	Demetre P. Ligor, B.S.E.E., P.E. (Mass) (Wave Phenomena, Semiconductor Physics & Devices)
John J. Cochrane, B.S., M.S., Ph.D. P.E. (Mass, N.Y., Vt.) (Environmental Technology)	Walter Messcher, B.M.E., M.S. (Computer Programming)
Edward M. Cook, A.B., A.M. (Mathematics)	Ernest E. Mills, B.S., M.S., P.E. (Mass) (Mechanical Engineering Technology, Day and Evening)
Warren C. Dean, A.B., M.A. (Differential Equations)	Louis J. Nardone, B.S., M.S., P.E. (Mass) (Electrical Engineering Technology, Day and Evening)
Paul A. Dunkerley, B.S., S.M., P.E. (Mass) (Fluid Mechanics)	Bernard C. Reddy, B.S., Ed.M. (Introductory Physics)
William D. Finan, A.B., M.A. (Introductory Mathematics)	Harold M. Sharaf, B.S., M.S. (Principles of Communication Systems)
John L. Freedman, B.S., P.E. (Mass) (Electronics)	Thomas H. Wallace, B.S., M.A., Ph.D. (Physics)
David Goldberg, B.S., M.S. (Electrical and Electronic Graphics)	Willard B. Whittemore, B.S., in C.E., Ed.M., C.A.G.S. (Algebra and Trigonometry)
Arthur F. Gustus, B.S., Ed.M. (Physics)	Albert G. Wilson, Jr., B.S. in C.E., M.S., P.E. (Mass), S.E. (Illinois) (Statics and Dynamics)
Francis R. Hankard, B.S., M.A. (Physics)	Kenneth S. Woodard, B.S., M.S. (Aviation Technology)
Joseph J. Hansen, A.B., M.B.A. (Mathematics for Business Management)	
George C. Harrison (Pulse Circuits & Elect. Labs.)	

Office Staff

Rasma Galins, Administrative Secretary
Mary L. Tangney, Secretary
Doris S. Tortora, Secretary
Rebecca Silverman, Secretary of Records

the role and scope of lincoln college

Purpose

Lincoln College is charged with the responsibility for developing and offering college-level courses and curricula of an applied-science or technological nature. Its purpose is to assist professional personnel, qualified to deal with the applications and uses of the biological, natural, and physical sciences, in better meeting community needs. The programs of study conducted by the College have in common the following purposes and characteristics:

1. The programs of instruction prepare the graduate for activities allied to the fields of engineering, science, or medicine, but are more specialized than those required to prepare a person for full professional responsibilities.
2. The programs of instruction are more concise and more completely technological in content than professional curricula, though they are concerned with the same general fields of scientific, engineering, industrial, or clinical specialization.
3. The programs of instruction are based upon principles of science, and include post-secondary-school mathematics to provide the tools to achieve the technological objectives of the curricula.
4. Emphasis is placed upon the use of rational processes in converting theories and ideas into practical techniques, procedures, and products.
5. Extensive training for artisanship or craftsmanship is not included within the scope of the technological education programs.
6. Graduates from the associate degree programs have opportunities for educational work leading to the Bachelor of Engineering Technology and Bachelor of Science degrees.

Technology and the Technologist

Scientific and technological skills range over a very broad spectrum extending all the way from extremely simple craftsmanlike activity

to highly complex and abstract activity. At one end of the spectrum is the professional whose work is mostly theoretical in character. He studies, reasons, and visualizes how new knowledge may be used in the development of solutions to technical problems. Usually he is not completely knowledgeable of the detailed procedures used by the skilled craftsman who executes the ideas, procedures, and designs.

The technologist is the pivot-man on the professional-technologist-craftsman team. He works with the professional engineer, scientist, doctor, supervisor, and craftsman in converting knowledge of scientific theories and practical craftsmanship into products, procedures, and techniques. His responsibilities are technologically important — professional opportunities are limited only by ambition, ability, and education.

When employed in research, design, or development, the technologist usually acts as direct supporting personnel to the professionals. If he functions in a capacity related to production, operation, testing or control, he usually follows a course prescribed by a professional but may not work closely under his direction. If installation, maintenance, or sales are his areas of responsibility, he is frequently performing a task that would otherwise have to be performed by the professional. He thereby assumes the more routine professional functions demanded by our increasingly scientific and technical society.

In executing his functions, the technologist is required to use a high degree of rational thinking, to employ post-secondary school mathematics and the principles of the biological, natural, and physical sciences. The skilled technologist works with his mind as well as his hands. He considers why things work as well as how things work. To perform his functions efficiently, the technologist must effectively communicate technical and scientific information mathematically, graphically, and linguistically.

The Need for Technologists

Our present technological age, with its exploding accumulation of new information and discoveries in the physical, natural, and life sciences, has increased the need for people with specialized training in science and technology. Experts have recently estimated that in order to meet expanding needs, the number of students graduating from the nation's professional schools must double — a goal which is improbable in the near future.

The most reasonable alternative is to make our professional manpower most efficient by providing assistance in the form of specially trained technologists. Manpower experts believe that the present ratio of less than one technologist to each professional should ideally be nearer five to one

Opportunities for technologists are increasing at a faster rate than for any other occupational group — a 50 per cent increase is expected in the next five years. More than 200,000 technologists will be needed each year, whereas schools now graduate only 50,000 per year. The tech-

iologist's employment opportunities are varied and much demanded in health and public service organizations; atomic energy and electric power industries; metal fabricating industries; local, state, and federal government agencies; the armed forces; aerospace industries; chemical, petroleum, plastics, and metal industries, as well as transportation and communication industries.

PROGRAMS OF INSTRUCTION

Recognizing the growing need for technicians and technologists and their expanding role in modern society, Lincoln College offers Pre-Technology Preparatory Courses and degree programs leading to the Associate Engineering (A.E.); Associate in Science (A.S.); and Bachelor of Engineering Technology (B.E.T.) as follows:

Pre-Technology

Introductory Mathematics, Basic Mathematics, Physics, and English	pages 58-59
Reading-Improvement Program (non-credit)	page 59
Programmed Instruction Review Courses (non-credit)	page 60

National Technology

National Technology (A.S. degree) — 2 years days	page 63
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Civil Engineering Technology

Architectural Engineering Technology (A.E. degree)	page 66
Environmental Engineering (A.E. degree)	page 67
Structural Engineering Technology (A.E. degree)	page 69
Surveying and Highway Engineering Technology (A.E. degree)	page 70
Civil Engineering Technology (B.E.T. degree)	pages 71-72

Electrical Engineering Technology

Electrical Power Engineering Technology (A.E. degree)	page 74
Electronics Engineering Technology (A.E. degree)	page 75
Electrical Engineering Technology (B.E.T. degree)	pages 76-78
Electrical Engineering Technology (B.E.T. degree) (Day Cooperative Curriculum)	pages 79-80

Mechanical Engineering Technology

Mechanical Engineering Technology (A.E. degree)	page 82
Statistical Engineering Technology (A.E. degree)	page 83
Mechanical Engineering Technology (B.E.T. degree)	pages 84-85
Mechanical Engineering Technology (B.E.T. degree) (Day Cooperative Curriculum)	pages 86-87

Interdisciplinary Science and Engineering Technology Programs

Chemical-Physical Technology (A.S. degree)	page 89
Mathematical-Physical Technology (A.S. degree)	page 90
Fire Technology (A.S. degree)	page 91
Bioelectronic Engineering Technology (A.E. degree)	page 92
Computer Engineering Technology (A.E. degree)	page 93
Control Systems Engineering Technology (Certificate)	page 94
Environmental Control Technology (B.E.T. degree)	page 95-96
Mechanical-Structural Engineering (B.E.T. degree)	page 97

admissions information

ADMISSION

the Student Body

The student body of Lincoln College is composed of recent high school graduates and mature men and women. Most students are employed in industry with vocational experience ranging from very little for the recent secondary school graduate to as much as 20 or 30 years for individuals seeking increased professional responsibility and status. Many technical career categories are represented — industrial, engineering, scientific, and allied-medical — demonstrating that, in our increasingly complex society, the key to personal advancement is education.

academic Background

A firm knowledge of the fundamentals of mathematics and science is the foundation upon which successful achievements in the more advanced technological courses are built.

Applicants to Lincoln College are, in many cases, mature adults who, though they have experience in industry or previous education, have been away from formal study for some time and, therefore, have doubts concerning their study habits and their algebra, geometry, and science proficiency. Those who anticipate some difficulty in adjusting to the first-year course requirements are advised to give very serious consideration to enrolling in non-credit courses in introductory mathematics, introductory physics, and/or introductory chemistry. These courses are designed to develop adequate background for the basic courses in the degree programs.

Program Counseling

Career planning through self-analysis and professional counseling assists students in planning educational programs appropriate to their objectives. Entering students are encouraged to arrange for personal interviews with Lincoln College program counselors for assistance in planning their academic programs. Counselors are available by appointment.

at the Huntington Avenue Campus, Boston; the Suburban Campus; Burlington; the North High School, Framingham; the Weymouth North High School, Weymouth; the Norwood Junior High School North, Norwood; Norwood Airport, Norwood; and the Lynn English High School, Lynn. Students are encouraged to present records of prior education whenever possible. The effectiveness of the counseling review is greatly enhanced by this information. The University, through its Counseling and Testing Center and its Career Information Center, is also prepared to assist applicants whose educational and vocational goals are more complex or less firmly defined.

Application for Admission

Applications for the programs of study offered in the Lincoln College are accepted for admission to the Fall (September), Winter (January), Spring (March), and Summer (June) Quarters. Applications should be filed as early as possible in advance of the opening of the quarter for which the student desires to register in order that eligibility and status may be established.

Information concerning admission may be obtained either by writing to Lincoln College or by requesting it at the time of visiting the College. The application for admission should be completed in detail and submitted to Lincoln College, Northeastern University, Boston, Massachusetts 02115.

All inquiries relative to the Day Cooperative programs should be referred to the Day College Admissions office 150 Richards Hall. See pages 79-80 and 86-87.

Mathematics Placement Test

Applicants requesting admission to regular first-year mathematics are required to demonstrate proficiency in introductory or basic mathematics through the Lincoln College Mathematics Placement Test. Students who request enrollment in the non-credit Introductory Mathematics course are not required to take the test. The Mathematics Placement Test will be administered during the registration period for each term of instruction at the Huntington Avenue Campus, Boston; the Suburban Campus, Burlington. The Mathematics Placement Test will be administered on selected dates at the North High School, Framingham; the Weymouth High School, Weymouth; the Lynn English High School, Lynn; and the Norwood Junior High School North, Norwood. In addition, the test is administered during the summer months. Contact the Lincoln College Office, 219 Hayden Hall, at the Boston Campus (437-2500).

Students who demonstrate satisfactory proficiency in the test will be permitted to register for the first-year courses in the program of their choice. To enroll in Engineering Physics (11.317) the student may need to take Introductory Physics.

If need for a strengthening of mathematical background is indicated, the applicant will be assigned to the Introductory Mathematics course.

Students enrolling in Introductory Mathematics may fill out their schedule by enrolling in Introductory Physics, Introductory Chemistry, or Engineering Graphics.

In every case the student should carefully consider his combined work and study load and register only for those courses which contribute to the development of a firm knowledge of fundamentals and which enable him to adjust to academic study requirements.

CLASSIFICATION OF STUDENTS

Applicants who have filed an Application for Admission and who are approved by the Lincoln College Academic Standing Committee are admitted as regular degree candidate students in the program which they have indicated on the application.

Special Students

Students having specific course needs, who do not desire a degree, may register for the courses if they have the required prerequisites or their equivalent. These students will be enrolled as "special students."

Matriculation

Degree candidates must file a petition for matriculation when they have completed a minimum of forty quarter-hours of work in Lincoln College or a review of their academic record and to insure that:

1. The student is entered in the permanent record as a degree candidate in the program of his choice.
2. Advance standing credit for transfer students is entered in their permanent record.

This review will assure that the student has:

1. Attained a satisfactory quality point average.
2. Presented evidence of completion of an accredited secondary school program by submission of a transcript of record or a high school equivalency certificate.
3. Demonstrated acceptable levels of ability and achievement in 15 units* of secondary school and/or collegiate work as follows:

Verbal Communication	4 units
Mathematics and Computation	3 units
Science and Technology	3 units
Other	5 units

4. The Academic Standing Committee may require a student to take one or more aptitude or interest tests if his credentials or academic record fail to completely satisfy the criteria for probable academic success. These tests will be administered by the University Counselling and Testing Center. A fee is charged for these tests.

* unit represents a year's work in a subject at an approved secondary school, community college, junior college, technical institute, or university.

TRANSFER STUDENTS AND ADVANCED STANDING CREDITS

Students transferring from community colleges, junior colleges, technical institutes, or other colleges and universities may transfer applicable credits toward the degree requirements of Lincoln College.

Students admitted with transfer or advanced standing credits from another institution must meet the requirements for admission as set forth under the regulations applicable to regular students. Advanced standing in the Lincoln College may be obtained by (1) Transfer of Credits or (2) Proficiency Examination.

Transfer of Credits

Subject to the approval of the Academic Standing Committee credit may be awarded for academic work completed in other approved schools, colleges, or universities if the following criteria are met: (a) the content of the course being submitted is equivalent to that of the corresponding course in the Lincoln College; (b) the average grade achieved in the course submitted is "C" or higher, and (c) the remoteness of the time of study does not negate its use as a prerequisite for an advanced course.

Applicants desiring advanced standing credit by transfer should indicate this desire at the time of filing the application for admission. The applicant should request the Registrar of the institutions of previous attendance to mail an official transcript to the Lincoln College Office.

Proficiency Examinations

Applicants who do not meet all the criteria for the normal transfer of credits, but who are able to supply evidence of sufficient knowledge of a subject as a result of previous training or experience, may petition the Academic Standing Committee for the privilege of taking a Proficiency Examination. If satisfactory proficiency is indicated by the examination advanced standing credits may be awarded or a substitute course may be recommended.

Readmission

Former students, who seek readmission to continue a program of study after having withdrawn from the College for a period of time, may be required to repeat courses which are prerequisites to advanced work.

REGISTRATION

Registration for Courses

Completion of admission requirements does not constitute official registration for courses. All students must be properly registered before attending classes. Registrations are processed by the Registrar's Office during the official registration periods. Former students should ascertain completion of prerequisite courses before registration. Students may register for full-year sequences of courses during the official registration periods. They are urged to register as early as possible in order to obtain the desired class schedule.

Changes in Registration

Changes in program should be initiated before the opening day of classes during the official registration periods.

Official Registration Periods

Official registration periods are scheduled before the Fall, Winter, Spring, and Summer Quarters during the academic year. Students are urged to register as early as possible during these periods. Dates of registration periods for each quarter are listed in the official 1974-1975 Academic Calendar (See pages 6 and 7).

Withdrawal

Simply ceasing to attend classes or notifying the instructor does not constitute official withdrawal from a course. To withdraw officially from a course, the student must notify the Registrar's Office in writing or complete the appropriate withdrawal form. Properly registered students who do not attend one of the first three sessions in any course will be automatically withdrawn from the class roll.

Courses in Other Departments of the University

Lincoln College students assigned to courses in other departments of the University are charged the tuition rates and other fees effective in the departments in which they are enrolled.

academic information

ACADEMIC OPERATIONS

Campuses and Extensions

All courses are offered at the Huntington Avenue Campus, Boston, with some courses available at the Suburban Campus or Wyman Jr. High School, Burlington; and at North High School, Framingham; English High School, Lynn; North High School, Weymouth; Norwood Junior High School North, Norwood; and for Aviation Technology students at the Norwood Airport, Norwood.

The Quarter Calendar

The regular school year, from September to June, is divided into three quarters of 13 weeks each. Twelve weeks are scheduled for instruction and final examinations with one week available for make-up classes and vacation time. A limited program of courses is offered during the summer quarter.

Class Sessions

At the Huntington Avenue Campus, lecture periods consist of one hour and forty-minute sessions beginning at 4:10 p.m., 6:00 p.m., and 7:50 p.m. each weekday and at 9:00 a.m. or 10:50 a.m. on Saturdays. At the Suburban Campus and Wyman Junior High School, Burlington, lecture periods will begin at 4:10 p.m., 6:00 p.m., and 7:50 p.m. At the North High School, Framingham, lecture periods will begin at 6:15 p.m. or 7:55 p.m. At the North High School, Weymouth; Lynn English High School, Lynn; Haverhill High School, Haverhill; Norwood Junior High School North, Norwood; and Norwood Airport, Norwood; lecture periods will begin at 6:00 or 7:50 o'clock each evening. Day sessions at Norwood Airport begin at 8 o'clock each morning. Design and laboratory courses are of longer duration and may occupy a full evening. All laboratory courses are conducted on the Huntington Avenue Campus.

Course Work

All of the usual methods of instruction are employed — lectures, homework assignments, class projects, laboratory work, irregularly scheduled quizzes, and formal examinations. In addition, mid-course examinations are scheduled in most courses and a final examination is required at the completion of all courses. Students are responsible for fulfilling all the requirements of a course. In the event of absence, students must make appropriate arrangements for makeup with the instructor. Students must follow the procedures outlined below for makeup of missed mid-term and final examinations.

Student Study Areas

The UNIVERSITY LIBRARY is well equipped with technical literature. A detailed statement about its facilities and hours appears on pages 24 and 25.

The privilege of obtaining books from the Boston Public Library is extended to students of Lincoln College. Application for this privilege, which involves a fee, should be made directly to the Boston Public Library.

Additional study areas are available in the Ell Student Center Building.

Attendance

Students absent from regularly scheduled sessions in any subject, for whatever reason, may seriously jeopardize their academic progress and status. Students are expected to be in attendance at all the sessions scheduled in their courses. Excessive absence may be sufficient cause for the Registrar to remove the subject(s) from the student's schedule.

Withdrawal

Simply ceasing to attend classes or notifying the instructor does not constitute official withdrawal from a course. To withdraw officially from a course, the student must notify the Registrar's Office or complete the appropriate withdrawal form.

The Registrar will withdraw the student from a course who:

1. Does not attend one of the first three classes at the beginning of a 12 week quarter.
2. Does not attend one of the first two classes at the beginning of a summer term.

MAKEUP EXAMINATIONS

Mid-course Examinations

A student absent from a regularly scheduled mid-course examination or quiz may request permission to take a makeup examination. This is a privilege which may be denied if abused by an excessive number of petitions or for other reasons.

Students applying for makeup examinations must:

1. Request from the instructor permission to take the midterm examination or quiz.
2. The instructor will forward the examination to the Lincoln College Office for processing.

Makeup mid-term examinations and quizzes will be given on a Saturday at 9:00 a.m. in a designated room at the Huntington Avenue Campus according to the following schedule:

Examination Missed During	Date Scheduled
Fall Quarter	Nov. 30, 1974
Winter Quarter	March 8, 1975
Spring Quarter	June 7, 1975
Summer Terms	In course

Any student who does not take the makeup examination as scheduled will forfeit the makeup privilege.

Missed Final Examinations

If a student is absent from a final examination, he will receive a grade of "I" (Incomplete) in the course. He may petition for a makeup final examination at the Registrar's Office, 120 Hayden Hall.

A student does not automatically have the right to make up a missed final examination. Students must petition for this privilege. If the petition is granted, the student must pay a fee of \$5.00 for taking the special final examination. Petitions may be obtained from the Registrar's Office or in each off-campus Administration Office. Petitions for missed finals must be filed in accordance with the schedule listed below:

Final Examination Missed During	File Petition No Later Than	Date Scheduled
Fall Quarter	January 18, 1975	February 8, 1975
Winter Quarter	April 19, 1975	May 17, 1975
Spring Quarter	July 12, 1975	August 16, 1975
Summer Quarter	October 4, 1975	November 1, 1975

Students will be notified by mail when and where to take the missed final examination. All examinations will be administered on the Boston Campus. Those who do not take makeup final examinations as scheduled forfeit the makeup privilege.

ACADEMIC STANDARDS

The student is required to maintain appropriate levels of academic achievement in terms of grades, quality-point average, and the quantitative credit requirements of his program of study to satisfy academic progress criteria and achieve graduation from Lincoln College.

Grading System

The following system of grading is used. The numerical equivalent for each grade is in parentheses.

- A (4.0) — Outstanding
- B (3.0) — Good
- C (2.0) — Satisfactory
- D (1.0) — Poor
- F (0.0) — Failure
- I (—) — Incomplete

- L Audit (No Credit)
- S — Satisfactory (Pass-Fail grade)
- U — Unsatisfactory (Pass-Fail grade)
- X — Incomplete (Pass-Fail grade)
- * Grade not received

A general average of "D" is unacceptable and will not allow a student to continue in Lincoln College or to receive a degree from Northeastern University. The "F" grade is a definite failure. The standard procedure for clearing failures in courses offered in Lincoln College is to repeat the course. In some instances circumstances may warrant amending the standard procedure. These circumstances are described in the *Student Handbook* for day students. An I or X (incomplete) grade is used for a temporary grade to show that the student has not completed the course requirements.

Pass-Fail Courses

Any student who is not on academic probation and who has completed 40 quarter hours of academic work may register for one pass/fail course and, thereafter, for one course on a pass/fail basis for each 10 quarter hours of successfully completed work. Written permission of the appropriate academic dean must be obtained for each pass/fail course. At no time may a student register for more than one pass/fail course per quarter.

Such courses will be restricted to free electives outside the major field of specialization, so that no part of the specifically prescribed curricula will be affected.

The grades recorded on the basis of the pass/fail system of grading will not figure in the computation of the QRA.

Auditing Policy

Students are permitted to audit courses upon filing the usual registration forms and paying the regular tuition fees. There is no reduction in fees for auditing. An auditor may participate in class discussion, complete papers and projects and take tests and examinations for informal evaluation, if desired. However, regardless of the amount or quality of work completed, **no academic credit will be granted at any time for courses audited.**

Audit Procedure

The student's decision to take a course on an audit basis must be communicated in writing to the Registrar prior to the fourth class meeting of the course. No exception to this procedure can be approved without authorization by the Academic Standing Committee of the College.

Grade Reports

Grades are mailed to the student by the Registrar and will not be given out at the office of either the Registrar or Lincoln College. Under no circumstances will grades be given over the telephone.

Quality-Point Average

The quality points earned by the student in a given course are determined on the basis of the letter-grade achieved and the number of credit hours carried by the course. The total quality points earned divided by the total number of credit hours constitute the quality-point average.

- When the student has more than one grade in the same course, the most recent grade will be used in the calculation of the quality-point average.
- A grade of "I" will not be considered in the calculation of the final quality-point average.
- Although advanced standing credits (ASC) allowed for acceptable work completed at other institutions by transfer students count toward completion of the quantitative credit requirements, neither the credits nor the grades earned in such courses are included in quality-point average computations.
- In programs made up of combined U.C. and L.C. courses, the cumulative quality-point average will include all work in both colleges.

For example, a student who has registered for seven courses, cleared a failure in one of them and received advanced standing credit (ASC) in another, may calculate his quality-point average as follows:

Grade Achieved	Numerical Equivalent	Credit Hours	Quality Points
A	4.0	×	4 = 16.0
B	3.0	×	4 = 12.0
C	2.0	×	3 = 6.0
D	1.0	×	3 = 3.0
F	0.0	×	2 = 0.0
FB	3.0	×	2 = 6.0
I	—	×	— = —
IC	2.0	×	2 = 4.0
ASC	—	×	— = —
		Totals	20 47.0

$$\text{Quality-Point Average} = \frac{\text{Total Quality Points (47.0)}}{\text{Total Credit Hours (20)}} = 2.350$$

The Registrar's Office will not be able to recalculate or confirm the calculations of quality point averages for individual students. Each student's record will be brought up to date before his graduation. In the meantime, borderline cases will be checked by the Lincoln College Academic Standing Committee.

Academic Progress Criteria

It is expected that the student will at all times endeavor to achieve a high record of achievement. The Academic Standing Committee reserves the right to review all students' records and deny readmission to those who fall below a minimum quality level of achievement. This requirement has been established as follows:

In order to be allowed to remain in the College, a student must have achieved a quality-point average of 1.4 at the completion of 24 quarter

hours; 1.5 at the end of 48 quarter hours; and 1.6 at the end of 72 quarter hours.

It should be further noted that a student who accumulates the equivalent of six uncleared failures may be considered ineligible to continue his program of study.

Scholastic Probation

The Academic Standing Committee has the authority to dismiss from the College or place on scholastic probation any student whose scholarship is deficient for the following reasons: low quality-point average, excessive outstanding failures regardless of quality-point average.

A student on scholastic probation should be particularly diligent in his current courses and make every effort to clear his academic deficiencies as soon as possible. Students whose academic record does not improve or whose failures are not properly cleared may not be allowed to register for further courses.

When a student on scholastic probation has cleared all or a substantial part of his outstanding failures he may petition the Academic Standing Committee for removal from the probation list.

Disciplinary Probation

The Academic Standing Committee has the authority to dismiss from the College or place on disciplinary probation any student whom it may deem unworthy because of conduct or character. The Committee may ask any student to withdraw from the College who is obviously out of sympathy with its aims and ideals.

GRADUATION REQUIREMENTS

To receive the degree of Associate in Engineering, Associate in Science, Bachelor of Engineering Technology, the student must fulfill the following requirements:

1. Must have been formally accepted into "degree candidate" status by the Committee on Admissions.
2. Complete all the courses of his particular curriculum, either by attendance at the Lincoln College or by receiving Advanced Standing Credit.
3. Complete associate degree programs in eight years and bachelor's programs in 12 years from the date of entrance into Lincoln College. Extensions of time may be granted by the Academic Standing Committee.
4. Be in attendance for at least a year preceding the date on which he expects to graduate; and he must complete at least one fourth of his work in Lincoln College.

5. Achieve a quality-point average of at least 1.75 in courses taken in the College to be awarded the Associate in Engineering or Associate in Science degrees and 1.80 for the Bachelor of Engineering Technology degree.
6. Pay the Graduation Fee of \$25.

In addition students:

7. May not earn two associate degrees or two bachelor's degrees in the same field of academic specialization.
8. Must complete a minimum of 30 quarter hours of additional credits to be awarded more than one associate or bachelor's degree.
9. May not be awarded the associate and bachelor's degree at the same commencement.
10. Must petition for transfer of credits completed at other institutions prior to January 1 of the year in which the degree is to be awarded.

ACADEMIC AND PROFESSIONAL AWARDS

The academic programs offered by the Lincoln College and the teaching, counselling, and professional efforts of the faculty and staff are aimed at motivating the student toward the highest possible levels of academic achievement. To encourage scholarly and professional excellence and to recognize quality achievements, the following awards are made at appropriate times during the academic year:

Honor List and Dean's List Scholars

Students maintaining honor grade averages — minimum quality average of 3.000 and no "D" grades — during a quarter while carrying a minimum of 6 quarter hours credit are recognized as Dean's List Scholars. Students desiring certificates attesting to this honor should request them from the Lincoln College Office.

Scholastic Achievement Certificates

Upon graduation with an associate degree, Scholastic Achievement Certificates will be awarded to those students who have achieved distinctly superior attainment in the academic work as follows:

Scholastic Achievement	3.000-3.499 Q.P.A.
High Scholastic Achievement	3.500-3.749 Q.P.A.
Highest Scholastic Achievement	3.750-4.000 Q.P.A.

In order to be eligible for a Scholastic Achievement Certificate the student must earn a minimum of 48 quarter hours of credit in Lincoln College.

Graduation with Honor

Upon graduation, honors will be conferred upon students who have achieved distinctly superior academic achievement in a program leading to the Baccalaureate Degree as follows:

Honor	3.000-3.499 Q.P.A.
High Honor	3.500-3.749 Q.P.A.
Highest Honor	3.750-4.000 Q.P.A.

In order to be eligible for Honors the student must earn a minimum of 72 quarter hours credit in Lincoln College and receive a vote of approval from the faculty with responsibility for his program:

University Awards

The University Awards are presented annually to seniors pursuing associate degree programs, who have achieved high ranking cumulative academic records. The tuition scholarship awards are accompanied by an appropriate certificate.

Lincoln College Faculty Scholarship Award

The faculty encourages the achievement of scholarship by making monetary awards.

The Faculty Scholarship Fund was established in 1969 by voluntary contributions of the Lincoln College Faculty.

The Scholarship Committee determines the number and size of awards based on available funds.

The basis of the award is determined by need, academic achievement and personal qualifications. The Scholarship Committee invites applications by announcing the specific requirements of eligibility during the school year.

Technology Awards

The Technology Awards are presented annually to seniors, pursuing associate degree programs, who have demonstrated superior academic and professional capabilities in their special career fields. The scholarship awards and appropriate certificates are distributed to outstanding students enrolled in the following program categories:

- Civil Engineering Technology
- Commercial Aviation Technology
- Computer Engineering Technology
- Electrical Engineering Technology
- Mechanical Engineering Technology
- Science Technology
- Fire Technology

Class Marshal Award

The Class Marshal Award is presented annually, at the Class Day Banquet for Graduates, to the top ranking senior in a baccalaureate program. The award consists of an appropriate certificate, a selection of books, and the President's Letter of Commendation.

Sigma Epsilon Rho Awards

Sigma Epsilon Rho, the evening colleges scholastic honor fraternity, annually awards plaques and scholarships for outstanding scholastic achievement to the highest ranking students in University and Lincoln Colleges at the end of their junior year.

Sigma Epsilon Rho Honor Society Scholarship Award

The Sigma Epsilon Rho Honor Society Scholarship Award, established in 1974 by the membership of the Society, is awarded annually to an undergraduate student of University and/or Lincoln College at Northeastern University. Eligible students must have a cumulative Quality Point Average of 3.0 or better after completing 80 percent or more of their required studies.

Alumni Award for Professional Promise

Established in 1947 by the Northeastern University Alumni Association, the Alumni Award for Professional Promise is presented annually at a final senior class meeting in the spring of the year. The award is made to the senior who has demonstrated unusual professional promise through character traits, scholastic achievement, and work performance.

E. W. Wiggins Aviation Awards

The E. W. Wiggins Aviation Awards provide scholarship aid to students, enrolled in the Commercial Aviation Technology Program, who, in the judgement of the Northeastern University-Wiggins Airways Advisory Committee, have demonstrated the highest degree of proficiency in flying and related courses during the academic year.

Leslie B. Cutler Aviation Awards

The Leslie B. Cutler Aviation Awards were established by the members of the Aero Club of New England to honor and give recognition to the late Senator Cutler's service and devotion to the interests of aviation in the Massachusetts General Court, national legislative bodies, and her private life. These scholarship awards are made to students in the Commercial Aviation Technology Program who most typify the same interest, devotion, and leadership demonstrated by Senator Cutler during her long and distinguished public career.

financial information

TUITION

Initial Registration Fee

A ten dollar (\$10.00) registration fee, required of all new students, is due and payable upon registration. This fee is nonrefundable.

Tuition

Tuition for all part-time evening courses is \$32.00 per quarter hour of credit. Tuition for Day BET students will be based on the current day school rate. Charges for registration and tuition for special courses are at the rate specified for each course. Students are permitted to audit courses; however, there is no reduction in fees for auditing.

Students are not permitted to attend class sessions or take any examination or test until they have paid their tuition fees or have made satisfactory arrangements for payment.

Students will not be advanced in class standing, nor permitted to re-enroll in the University, nor will degrees be conferred, until all financial obligations to the University have been met.

No certificate of honorable dismissal will be issued to any student who has not fully met his financial obligations to the University.

Non-credit courses are charged at quarter hour rates equal to those of credit courses meeting on an equivalent contact-hour schedule.

Aviation Technology Tuition (Day Program)

FIRST YEAR	(All Students)	
Quarter 1 \$1090	Quarter 2 \$965	Quarter 3 \$913
Summer Quarter 4 \$912	(Flight Option)	
SECOND YEAR	(Flight Option)	
Quarter 5 \$904	Quarter 6 \$884	Quarter 7 \$916
SECOND YEAR	(Non-Flight Option)	
Quarter 5 \$512	Quarter 6 \$512	Quarter 7 \$512

Tuition Deposit

Applicants accepted for admission to the day program must upon request pay a non-returnable tuition deposit of one hundred dollars (\$100) as evidence of their intention to enroll, and this will be applied on their first tuition payment.

Additional Flight Courses

Certified Flight Instructor	\$ 471	\$ 499
Instrument Flight	\$565	\$ 565
Helicopter Flight	\$1080	\$1080

(These rates cannot be guaranteed beyond the current academic year.)

Additional Time: Students requiring additional time beyond the prescribed course limits shall be charged for such time at the regular Wiggins-Northeastern rates.

Flight Tests: Flight tests are not included in the regular course curriculum. Charges will be made for the Commercial Flight Test and the Instrument Flight Test on the basis of 1½ hours of aircraft and 1½ hours of ground time at the regular Wiggins-Northeastern rate. The Instructor Flight Test which must be given by a regular FAA Examiner requires 1½ hours of aircraft time only.

Tuition for all courses is charged on a quarter basis and is payable in full at the beginning of each quarter. As a convenience without additional charge, and at the student's request, the Bursar's Office will allow payment in two installments.

Deferred-Payment Privilege

Occasionally situations develop, usually beyond the control of the student, which make it difficult to meet payments in the regular manner. Under such circumstances the student is advised to discuss his problem personally with the Bursar's Office where a convenient deferred payment agreement can be worked out. A service fee of \$2 is charged for this privilege.

Late Payment Fee

Payments of tuition are due by Saturday of the week in which the bill is dated. If payment, or a deferred payment agreement is not arranged by that date, a late fee of \$10 is charged by the Bursar.

Refund of Tuition

The general policy in all schools and colleges of the University with respect to refunds of tuition to students is as follows:

The University provides all instruction on an academic quarter basis for which students pay at the beginning of each quarter. Tuition refunds will be granted through the first four weeks of a quarter only when specific conditions are met. Questions regarding refunds should be discussed with the Bursar.

Tuition refunds will be granted only on the basis of the date appearing on the official withdrawal application when filed with the Registrar in Room 120 Hayden Hall. Non-attendance does not constitute official withdrawal.

Refunds will be granted in accordance with the following schedule:

official withdrawal filed within:	percentage of tuition
1st week of quarter	100%
2nd week of quarter	75%
3rd week of quarter	50%
4th week of quarter	25%

Tuition Underwritten by Employers

An increasing number of companies are underwriting part or all of the cost of tuition of students in their employ. In cases in which payment is made directly by the employer to the University, the student should furnish the Bursar's Office a purchase order covering his registration or a statement from an officer of his company certifying that the company is underwriting the tuition.

Student Bursar

All inquiries about student accounts should be directed to the Student Account Bursar, 437-2270.

Veterans Benefits

Veterans benefits depend on course load and increase sharply when a student's program exceeds 8 quarter hours per quarter. Questions and applications should be directed to room 245 RI.

SPECIAL FEES

Student Center Fee

Students attending the Huntington Avenue Campus, Boston, in the evening in a part-time program of study will be assessed a Student Center Fee of 75¢ per quarter.

Health Service Fee

Students attending the Boston, full-time Day Co-op B.E.T. programs are required to pay a Health Service Fee of \$90.00. The program is available to Aviation Technology Students on an optional basis.

Missed Final Examination Fee

Students absent from the regularly scheduled final examination at the end of a course may petition for a "special final examination." The fee for each examination requested by the student is \$5. The fee must be paid when the petition is filed in the University Registrar's Office.

Proficiency Examination Fee

Applicants for admission may petition to be awarded advanced standing on the basis of achievement demonstrated by a "proficiency examining"

tion." The fee for each examination requested by the applicant is \$10. The fee must be paid when the petition is filed in the Lincoln College Office.

Graduation Fee

The University graduation fee, charged to those who are candidates for the associate or bachelor's degree, is \$25, payable on or before May 1 of the year in which the student expects to graduate.

Transcript of Record Fee

Students may request transcripts of their records at the University Registrar's Office. There is no charge for the first transcript. After the initial transcript there is a charge of \$1 per copy, payable in advance. If more than one transcript is requested at one time the charge is \$1 for the first copy and 50¢ for each additional copy.

TEXTBOOKS AND SUPPLIES

Students purchase their own textbooks and work materials. The cost varies according to the subject for which the student is enrolled. The average cost for a normal program of four subjects generally ranges from \$25 to \$50. Textbooks for single courses range from \$4 to \$15.

Students enrolled in Engineering Graphics should be prepared to spend \$10 to \$15 for drawing supplies and \$10 to \$20 for a set of drawing instruments in addition to the textbooks.

LOAN PROGRAMS

Full-time students in Lincoln College who are pursuing the B.E.T. Program should refer to the Undergraduate Catalog for financial aid information.

National Direct Student Loan

This program is available to students who are carrying at least one-half the normal academic workload, are accepted as degree candidates, and who show evidence of financial need.

The Federal maximum a graduate student may borrow is \$5,000 while pursuing their post-baccalaureate degree.

Repayment and interest on these loans do not begin until nine months after the student ceases to carry at least a half-time academic load at an institution of higher education. The repayment of principal may be extended over a ten-year period with the interest at the rate of 3% per annum. Repayment may be deferred up to a total of three years while a borrower is serving as a Peace Corps or VISTA volunteer.

Community Sources

Students and their families are urged to explore community, industrial, and foundation sources for collegiate financial aid. Parental employers or the appropriate union organization may be a source. In addition, local,

civic, political, religious or educational leaders are often aware of aid sources in the immediate community. Some typical sources may include: P.T.A., Kiwanis, Lions, Elks, Knights of Columbus, Masons, Sons of Italy, Rotary, State Rehabilitation, American Legion, etc.

University Grants

Each year Northeastern University grants a substantial number of full and partial tuition grants to students who have demonstrated both above-average scholastic achievement and financial need. All applications for aid are automatically considered for all grants administered by the University. It is not necessary for an applicant to specify the grant in which he is interested.

Veterans' Benefits

Any veteran covered by the Veterans Readjustment Act of 1966, Public Law 89-358, should report to Room 245 Richards Hall to fill out the proper enrollment forms. These forms will be made available during registration periods for all students in the Law Enforcement Programs at special off-campus locations.

Students needing additional information as to eligibility, allowances, or other details are urged to contact their local office of the Veterans Administration as early as possible.

Guaranteed Student Loan Program

Under this program, students who are matriculated degree candidates, enrolled for at least one-half the normal academic work load, may borrow from a participating bank or other financial institution. Terms and conditions vary from state to state, but a student generally may borrow up to \$1,500 a year (the law allows a maximum of \$2,500 per year) depending on financial need. The federal government pays the interest while the student is in school if the student is eligible for interest subsidy.

The student must have submitted through the College Scholarship Service, a Parents' Confidential Statement or if he has been declared financially independent by the Financial Aid Office, a Students' Confidential Statement. These forms are available in the Financial Aid Office.

Applications for the loan itself are available from local banks or the Education Office of your State government. Additional information and necessary application forms for Massachusetts residents are available from the Financial Aid Office.

Martin Luther King, Jr. Scholarship Fund

Established in 1969 in memory of the late Rev. Martin Luther King Jr. Awards are made as openings occur, to adults from minority groups who would otherwise be unable to continue their education. Stipends will cover tuition expenses not to exceed six quarter hours in any academic quarter. Excluding Summer Quarter).

The University does not award financial assistance in any form to non-citizens of the United States.

student activities and alumni information

Evening Student Council

The Evening Student Council was formed to provide a representative body to promote the welfare of the student body in non-academic areas and to foster extracurricular activities which will enrich University life. It affords participants opportunities to meet and develop close personal relationships with fellow students and administrative staff.

The Evening Student Council provides students with opportunities to develop leadership skills and gives them a chance to discuss matters of professional interest with experts in their chosen field.

The Council is made up of interested students in University and Lincoln College, representatives of part-time interest groups, and those specially certified by the Council because of their demonstrated interest in the overall adult programs of the University.

The E.S.C., a member of the International Association of Evening Student Councils, meets on the first Monday of each month at 8:30 p.m. Students are welcome to visit, observe, and express opinions concerning evening student life.

Social and Professional Clubs

Student activities for part-time students are planned, organized, and operated by the student body with the assistance of the Director of University-Lincoln College Student Activities. The programs are designed to keep pace with the changing needs of adult students and to provide maximum opportunity for student participation. All part-time students in University College and Lincoln College are welcome to participate.

The program is flexible in nature and pioneering in spirit to meet the needs of adult students. The Office of University-Lincoln College Student Activities is particularly interested in developing new clubs which will benefit students professionally and educationally. If students wish to

start clubs related to their professions, this office will help them plan and organize clubs on the local and national level. The program is dedicated to assisting the adult student in the development of his fullest potential. The University-Lincoln College Student Activities Office is located in 102 Churchill Hall.

Evening Ski Club

The Evening Ski Club was established as a special interest club by students in University and Lincoln College to give skiers an opportunity to meet other skiers for the purpose of promoting the sport and its related activities. Events sponsored by the Evening Ski Club include wine and cheese parties held locally and in the various ski areas of Maine, New Hampshire, and Vermont. A summer clambake is also arranged on a local beach, usually in July or August. Meetings are held from October through April on a bi-weekly basis on the main campus. Students interested should contact the Evening Student Activities Office in 102 Churchill Hall.

Use of Gymnasium Facilities

Specific schedules for use of the pool, weight training room, indoor athletic field and track, handball courts, gymnasium, and wrestling room are set up each quarter for use by all part-time students. In order to become eligible, students must obtain a temporary Gymnasium Pass each time they wish to use the Cabot Gymnasium Complex. Passes are available in the Cabot Complex, Monday through Friday from 4:30 p.m. to 9:00 p.m. and on Saturday and Sunday from 1:00 p.m. to 4:00 p.m. All students requesting a pass must present their Student Identification card, and passes will be issued only on a first-come, first-served basis. Students using the Cabot Gymnasium Complex are required to abide by all the rules of the gym and may be asked to complete a Medical Release Form.

Society for the Advancement of Management

The Society for the Advancement of Management is the recognized national professional organization of managers in industry, commerce, government, and education. It has been dedicated to the advancement of management and managers since 1912, when the original Taylor Society was established. University chapters operate in 190 leading colleges and universities in the United States, Canada, Puerto Rico, and Hawaii.

The Northeastern University chapter is open to all adult students interested in furthering their growth and insight into the practice of the management professional. Meetings, conferences, and seminars are held.

Pi Tau Kappa Fraternity

Pi Tau Kappa is a social fraternity open to all evening students. It is organized to enhance their social welfare and promote closer affiliation with the University.

Kappa Tau Phi Sorority

Kappa Tau Phi Sorority is a social organization open to all evening women students. Its purpose is to promote fellowship among the women students and to form a closer tie with the University. Monthly dinner meetings are held. Two scholarships are awarded annually to scholastically superior women students.

Alpha Eta Rho

International Aviation Fraternity

The Nu Epsilon Chapter is a social organization open to all Aviation Technology Students. It is organized to actively associate the interested students of aviation with leaders and executives in the industry. This close association, strengthened through the bonds of an international aviation fraternity, establishes opportunities for every member in his relation to aviation and inspires interest and cooperation among those in the profession who are also members of Alpha Eta Rho.

Lamplighter Column

News articles written by interested students in University and Lincoln College may be submitted to the *Northeastern Today* newspaper to be printed under a Lamplighter heading. All news articles should be sent to the Evening Student Activities Office, 102 Churchill Hall at least two weeks prior to publication. Due to space considerations in the *Northeastern Today*, some articles may require editing by its professional staff.

Alumni Association

More than 52,000 alumni are members of the all-University Alumni Association, which has as its prime purposes the promotion of the welfare of Northeastern University, the establishment of a mutually beneficial relationship between the University and its alumni, and the perpetuation of fellowship among members of the Association.

The Association headquarters is located in Room 101 Ell. The official records and addresses of alumni are maintained in Room 260 of the United Realty Building.

Activities of the Association, including the Homecoming Day celebration and the annual presentation of Professional Promise Awards to outstanding seniors in each of the Colleges, are directed by the Vice President for Alumni Affairs. Alumni officers also attend meetings of undergraduate classes to form a closer relationship between the Association and its future members.

The Alumni Relations Office assists the various class officers in planning class reunions. Each class normally holds a reunion every five years during the month of June. The Vice President for the Alumni Class Council is responsible for coordinating class activities and organizing class functions.

The Vice President for Alumni Clubs works in close association with officers of the more than 50 Regional Alumni Clubs which have been established from coast to coast. All alumni are eligible to become members of these organizations. The alumni clubs meet periodically, often in conjunction with visits from members of the faculty or with athletic events.

For Boston area alumni, monthly luncheon meetings are held in both the downtown and uptown sections of the city.

The Association also sponsors and assists the alumnae organization and the Varsity Club, both of which have their own officers and conduct various programs throughout the year. Through the Varsity Club, the Association presents trophies to the outstanding athlete of the year in each of the six major sports.

The Northeastern University Alumni Association is a member of the American Alumni Council, a professional organization composed of representatives of all major colleges and universities in the United States and Canada.

Alumni Relations

The Alumni Association is providing a uniquely valuable service to both the University and the community by sponsoring admissions conferences for parents of high school students who are interested in attending college. These meetings, held in cooperation with the Northeastern Department of Admissions, have been extremely well attended. Local residents as well as alumni of the University have been invited to these conferences, which help to clarify many of the questions today's parents and young people have concerning application procedures of colleges and universities.

Placement Service

Many requests from employers are received by the College, for men and women of potential ability to fill important positions of responsibility. It is the policy of the College to serve the students whenever possible by placing them in those positions which promise attractive opportunities for development and advancement. The College, however, cannot guarantee to place its students, but it does endeavor to keep in close touch with those who desire placement service and to assist them in obtaining satisfactory advancements in positions and income. No charge is made for placement service. Those needing this assistance should arrange an appointment with the Director of Placement.

While the College cannot guarantee positions to its graduates, the number of requests usually exceeds the number available in the graduating class of any given year. The policy of the College is to find the best equipped and qualified men and women among its graduates for the positions which the College is called upon to fill.

The College, in recommending a graduate for a position, furnishes the prospective employer with the facts as to the graduate's ability, character, attitudes, habits, and other qualifications for the position as revealed by the College records. In the last analysis, however, placement in a position depends largely upon the graduate's ability to sell his services to the prospective employer. Most employers prefer to consider two or more candidates for a position and generally request the College to suggest more than one person. Many manufacturing and commercial firms throughout New England call upon the College to assist them in filling important executive and managerial positions.

academic programs of instruction

SCOPE OF PROGRAMMING

The Lincoln College and Lincoln College in collaboration with University College, the Wiggins Airways, Inc., and Hospitals in New England conducts educational programs at the undergraduate level in the following areas of technology:

Pre-Technology Preparation
Aviation Technology
Science Technology
Civil Engineering Technology
Electrical Engineering Technology
Mechanical Engineering Technology
Computer Engineering Technology
Environmental Control Technology
Fire Technology

Program Selection

Students should determine that the program they desire is offered in a suitable time period. Most programs are offered in the evening on a part-time basis. However, Aviation Technology is offered on a full-time day basis.

In the fields of Electrical Engineering Technology and Mechanical Engineering Technology, full-time day cooperative programs were established in the fall of 1971. Students may enter as freshmen or transfer with advanced standing by applying to the Office of Admissions, Northeastern University, 150 Richards Hall.

Degrees and Certificates

Lincoln College conducts education programs on the undergraduate level in various technological areas leading to the following degrees and certificates:

1. Associate in Science degree (A.S.) requiring 96 to 99 quarter hours of credit.
2. Associate in Engineering degree (A.E.) requiring 96 quarter hours of credit.
3. Bachelor of Engineering Technology degree (B.E.T.) requiring 180 quarter hours of credit.

4. Certificates may be earned in specified programs with a minimum of 30 quarter hours of credit.
 5. Most courses are available for special students.
- Lincoln College collaborates with University College in programs leading to:*
6. Bachelor of Science degree (B.S.) requiring 174 to 180 quarter hours of credit.

Opportunities for Associate Degree Graduates

Graduates of the Engineering or Science Technology Programs in Lincoln College, or other similar colleges and institutions, who have earned the Associate in Engineering or the Associate in Science degrees, may transfer applicable credits toward the degree requirements in the baccalaureate programs in Engineering Technology, Medical Technology, or Industrial Technology.

Those who have maintained a quality-point average of 2.500 or higher in the Associate degree programs may apply for transfer to either of the following College of Engineering curricula: (1) day-college Cooperative Education programs in Civil, Mechanical, Electrical, or Industrial Engineering with credit for up to two years of the five-year program, or (2) the part-time evening programs in Civil, Electrical, or Mechanical Engineering with credit for the first three years of the eight-year programs. Fractional credit may be awarded to students with a quality-point average slightly lower than 2.500.

PRE-TECHNOLOGY PREPARATION (Non-Credit)

Beginning students who have been away from formal study for some time are frequently concerned about their study habits and their verbal, mathematical, and scientific backgrounds. Applicants who anticipate some problems should give serious consideration to enrolling in the non-credit introductory courses, the Reading Improvement Program, or doing review work through programmed instruction at the Learning Center.

Introductory Courses

These courses are designed to develop background for basic courses in the degree programs and thus increase the probability of successful achievement in advanced technology courses.

Introductory Mathematics I and II

A two-quarter review of high school algebra and some plane geometry designed to prepare students for the credit course in 10.307, College Algebra and Trigonometry I. These courses are required of students who do not demonstrate sufficient algebra proficiency on the Mathematics Placement Test. (See course description for 10.301 and 10.302 page 125.)

Introductory Physics I and II

A two-quarter relatively non-mathematical introduction to the concepts of physics designed to prepare students for the credit courses in 11.317, Physics I or 11.304, General Physics I. (See course description for 11.301 and 11.302, page 128.)

Basic Mathematics I and II

A two-quarter review of basic algebra designed to prepare students for the credit course in 10.327 Mathematics I. These courses are required of students who do not demonstrate sufficient proficiency in algebra on the Mathematics Placement Test. (See course descriptions for 10.330 and 10.331, page 126.)

English for International Students I, II, III

A three quarter, non-credit sequence for foreign speaking students covering introduction to English grammar with emphasis on listening, speaking, and writing; selected readings and exercises to strengthen vocabulary and pronunciation; preparation of written and oral reports, business and social correspondence; and advanced work in written and spoken English preparatory to entering 30.601, Composition and Rhetoric I.

General Interest Courses

The following courses of general interest are offered for students who desire to inquire into the technical fields but may not have the mathematical background to pursue the professional courses. In general, these courses may not be substituted for similar courses in the several technical curricula.

1. Technology of Modern Architecture I, II
2. Man and Materials
3. Electric Devices and Systems I
4. Electric Devices and Systems II
5. Interpretation of Industrial Drawings
6. Foundations of Mathematics I
7. Foundations of Mathematics II
8. Foundations of Mathematics III
9. Man's Physical Environment I
10. Man's Physical Environment II

Reading Improvement

The ability to read well is one of the most important basic tools for the successful completion of a college program. The University's Center for Reading Improvement gives the student an opportunity to develop good reading habits in preparation for the intensive reading assignments of college level courses. The following core skills are covered: previewing, locating main ideas and related details, using guide words and phrases,

identifying structural patterns, outlining and summarizing, note-taking, vocabulary building, skimming and scanning, speed-reading, and critical reading. Further information may be obtained at the Center for Reading Improvement.

Programmed Study

Students may enroll in non-credit, self-study courses to better prepare themselves for college academic work and strengthen their high school background at the University's Learning Center.

Courses which may be useful to students in the Lincoln College programs in technology are:

Slide Rule
Algebra

Trigonometry
Study Skills

Effective Listening
Calculus

Spelling
English

AVIATION TECHNOLOGY PROGRAM

The Aviation Technology program offered by Lincoln College in cooperation with Wiggins Airways is designed to provide the scientific, technological, and business backgrounds required by the modern commercial pilot or entrepreneur in today's aviation and aero space world as it operates within the framework of the total ship-rail-motor-aircraft transportation industry.

The tremendous expansion of aviation as an increasingly important sector of the nation's industrial economy has accelerated the demand for appropriately trained and educated personnel for careers related to the flight, instructional, regulatory, management, and technical aspects of the aviation industry.

Flight opportunities range from pilot or co-pilot in the single- or multi-engine air-taxi and cargo services of the local, fixed-base feeder airlines or private company, to flight engineer, first officer or captain in the high-speed, multi-jet-engined services of the national and international systems of the major airlines.

The education-training-regulation sector of the aviation industry provides additional career opportunities as flight, ground, or simulator instructors or as flight examiners, training or safety directors and supervisors in the licensing and regulatory agencies of local, state, or federal government.

Persons knowledgeable in the technology and regulation of aviation, who are also skillful in dealing with people, may pursue challenging and rewarding careers in aviation sales, airport operations, aviation business management, etc.

The Aviation Technology related program presently offered by Lincoln College is a two year full-time day program which leads to an Associate in Science degree.

Wiggins Airways

Wiggins Airways has been in operation since 1929. Their facilities are located at Norwood Airport, 15 miles from the main Northeastern University campus, provide the flight training courses for the Aviation Technology programs offered by Lincoln College. They offer air taxi, rental, maintenance, repair, aircraft service parts, electronics, and helicopter services. Wiggins is the New England distributor for Piper Aircraft.

The airport facilities comprise two 4,000' runways, one with high intensity lights; a Federal Aviation Administration control tower in operation from 8 a.m. to 8 p.m. every day of the year; "H" facility (navigational aid for radio location); two Unicom frequencies for radio communication; and weather teletype service. Modern, air-conditioned classroom facilities,

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with visual aids, library, and other study aids are available for academic and ground related courses.

The aircraft fleet consists of eighteen Piper Cherokee 140's; two Piper Cherokee 180's; one Piper Cherokee 6; plus the following: Piper Twin Engine Aircraft — Comanche, Aztec and Navajos, two Flightmatic Simulators and a General Aviation Training Simulator. All aircraft are maintained on the premises in a federally certified aircraft repair station which is also Piper factory certified.

Aviation Technology

*Leading to the Degree of Associate in Science
(Day Program — 2 Years)*

The Curriculum of the Aviation Technology program is designed to provide, in the shortest reasonable time, the required amount of related academic instruction and accumulated flight time to thoroughly prepare the student for certification with the Private and Commercial Ratings by the Federal Aviation Administration. In the two year program, the student will acquire the scientific, technological, and business background for employment in a variety of positions including: Flight Crew Officers, Airport Management, Fixed Base Operations, Air Transportation, Aviation Sales, F.A.A. positions, etc.

Prerequisites: Satisfactory completion of the Mathematics Placement Test or Introductory Mathematics I and II (10.301 and 10.302). Medical Certificate — A.A. Class I or II. Interview with Director of Flight instruction and Aviation Program Counselor.

	First Year	Total Yearly Q.H.
0.307, 10.308	Algebra & Trigonometry, I, II	8
6.391, 96.392	Air Science A & B	6
0.603	Comp. & Rhet. (Int.)	4
0.606	Intro. to Literary Forms Int.	4
1.317, 11.318, 11.319	Physics I, II, III	12
48.514	Elements of Transportation & Distribution	2
96.399	Flight Physiology	2
96.395	Meteorology & Climatology A	3
48.593	Air Transportation A	3
6.331, 96.332, 96.333	Primary Flight I, II, III	4½

Summer Term (Flight Option)

6.341, 96.342	Commercial Flight I, II	3
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Second Year (Flight Option)

6.324, 96.325	Introductory Avionics; Avionics	8
96.393, 96.394	Advanced Air Science A, B	6
6.308	Aircraft Power & Systems	4
96.425	Chronology of Aviation	2
6.396	Meteorology & Climatology B	3
8.594	Air Transportation B	3
6.343, 96.344, 96.345	Commercial Flight III, IV, V	4½
96.376, 96.377	General Aviation Operations A, B	6
41.551, 41.552	Accounting A, B	6
96.360	Aircraft Analysis	2
		<u>Total 96</u>

Second Year (Non-Flight Options)

Students electing the Non-flight Option will replace the commercial flight courses with a sequence of air transportation, law enforcement, engineering, or airport management courses. These courses are listed under the description of courses at the end of the catalogue.

Students having definite plans to enter other upper class programs following the completion of the Associate degree should consult their adviser regarding entrance requirements prior to registering for second year courses.

Avionics Technology (Second year option)

The electronics equipment used in today's aircraft is becoming increasingly sophisticated and complex. This increases the need for highly trained Avionics Technicians to maintain this equipment. The Avionics curriculum provides the special knowledge and skills demanded in this special area. Graduates from this program are eligible to write the Federal Communications Commission examination for the 2nd Class Radio License.

69.324, 96.325	Introductory Avionics; Avionics	8
96.393, 96.394	Advanced Air Science A, B	6
96.308	Aircraft Power & Systems	4
96.396	Chronology of Aviation	2
48.594*	Meteorology & Climatology B	3
96.360	Air Trans B	2
96.376*	Aircraft Analysis	2
09.307, 09.308, 09.309	General Aviation Operation A	3
96.326, 96.327, 96.328	Electrical & Electronic Graphics I, II, III	6
03.387, 03.388	Avionics Laboratory I, II, III	6
09.351, 09.352	Integrated Circuits I, II	4
	Principles of Computer Programming I, II	4
		Total 50

*Optional

CIVIL ENGINEERING TECHNOLOGY PROGRAMS

Civil Engineering deals with the planning and construction of all kinds of relatively permanent structures and public works. Its major functions are: the preparation of surveys (topographical, geological, traffic, utility, etc.); the design of structures (buildings, bridges, dams, harbor facilities, etc.); the planning of municipal systems (water, sanitary, gas, flood control, air pollution control, etc.); and the development of transportation facilities (highway, railway, waterway, airway, etc.).

In performing these functions, the civil engineer will work in close association with professionals in the field, and he may develop technologically to function independently and in positions of managerial responsibility.

Employment opportunities for Civil Engineering Technology Program graduates are with town, city, state, or federal public works departments and agencies; private consulting, engineering, architectural, and construction organizations; and with railroads and the military.

The Civil Engineering Technology program and related programs offered by Lincoln College are:

Associate in Engineering Degree

Architectural Engineering Technology	page 66
Environmental Engineering Technology	page 67
Structural Engineering Technology	page 69
Surveying and Highway Engineering Technology	page 70

Bachelor of Engineering Technology Degree

Civil Engineering Technology	pages 71-72
Mechanical-Structural Engineering Technology	pages 97-98
Environmental Control Technology	pages 95-96

Architectural Engineering Technology

Leading to the Degree of Associate in Engineering

The program in Architectural Engineering Technology prepares the graduate to assume responsibilities in the planning, design, and construction of buildings. Employment opportunities are with architectural groups, consulting engineering firms, and government agencies.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

First Year

Course Numbers	Course	Q.H.
10.307, 10.308	College Algebra & Trig. I, II	8
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12

Second Year

01.301, 01.302, 01.303	Surveying I, II, III	6
02.301, 02.302, 02.303	Mechanics (Statics) I, II, III	6
*09.311, 09.312, 09.313	Engineering Graphics I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6

Third Year

01.321, 01.322, 01.323	Introduction to Structures I, II, III	6
01.401, 01.402	Tech. of Modern Architecture I, II	4
01.390	Construction Administration	2
02.321, 02.322, 02.323	Stress Analysis I, II, III	6
09.351, 09.352, 09.353	Principles of Computer Prog. I, II, III	6

Fourth Year

01.324, 01.325, 01.326	Structural Analysis I, II, III	6
01.331, 01.332, 01.333	Design of Structures I, II, III	6
01.393, 01.394, 01.395	Architectural Design I, II, III	6
01.371, 01.372, 01.373	Reinforced Concrete Design I, II, III	6

Total A.E. degree 96

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degrees.

* Course Nos. 27-541, 542, 543, Drawing I, II, III — a basic course in developing pencil, pen, and wash techniques; and the study of basic drawing problems using a variety of media — may be used to supplement this program.

Environmental Engineering Technology*Leading to the Degree of Associate in Engineering*

The program in Environmental Engineering Technology prepares the graduate to assume responsibilities related to the design, construction, operation, and supervision of municipal plants and systems concerned with the storage and distribution of water and also the disposal of sewage and waste in urban areas with due consideration for contamination and pollution. Employment opportunities are with town, city, and state public works departments, private engineering consultants, architects, contractors, and many other engineering organizations.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

First Year

Course Number	Course	Q.H.
0.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12

Second Year

1.301, 01.302, 01.303	Surveying I, II, III	6
2.301, 02.302, 02.303	Mechanics (Statics) I, II, III	6
3.311, 09.312, 09.313	Engineering Graphics I, II, III	6
3.321, 10.322, 10.323	Calculus II, III, IV	6

Third Year

1.341, 01.342, 01.343	Fluid Mechanics I, II, III	6
2.321, 02.322, 02.323	Stress Analysis I, II, III	6
3.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
2.544, 12.545, 12.546	†General Chemistry I, II, III	6

Fourth Year

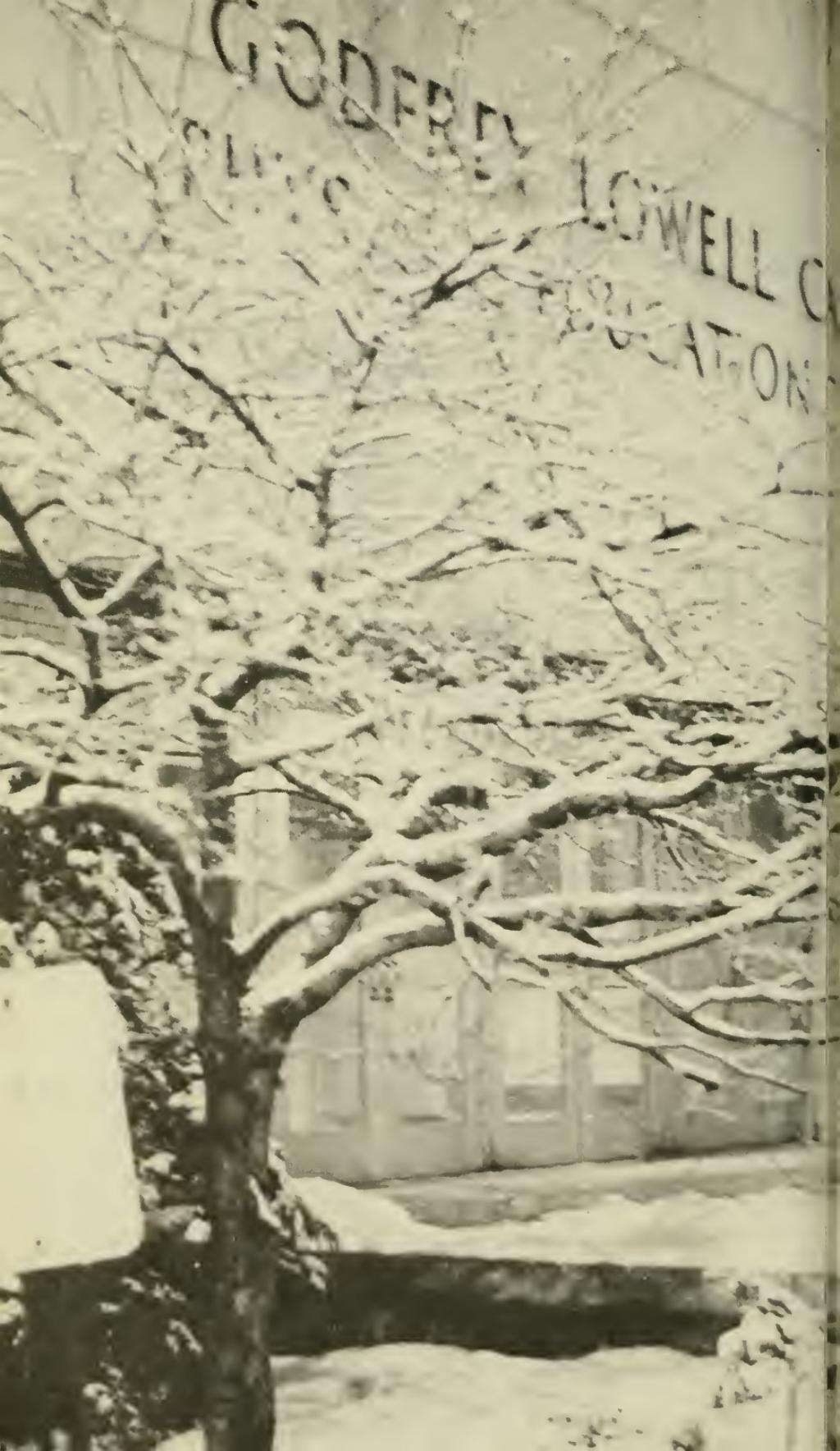
1.324, 01.325, 01.326	Structural Analysis I, II, III	6
1.351, 01.352, 01.353	Environmental Engineering I, II, III	6
1.361, 01.362, 01.363	Materials and Soil Mechanics I, II, III	6
1.371, 01.372, 01.373	Reinforced Concrete Design I, II, III	6

Total A.E. degree 96

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

Students may elect to add 12.547, 12.548, 12.549 Gen. Chem. Laboratory I, II, III (3 q.h.)

GODFREY
LAWRENCE LOWELL COLLECTON



Structural Engineering Technology*Leading to the Degree of Associate in Engineering*

The program in Structural Engineering Technology prepares the graduate to assume responsibilities related to the planning, design, and supervision of the construction of buildings, bridges, foundations; flood-control projects and all related structures. Employment opportunities are with consulting engineering firms, architectural groups, contractors, railroads, government agencies, the military, and other design-related companies.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

First Year

Course Number	Course	Q.H.
.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
.317, 11.318, 11.319	Physics I, II, III	12

Second Year

.301, 01.302, 01.303	Surveying I, II, III	6
.301, 02.302, 02.303	Mechanics (Statics) I, II, III	6
.311, 09.312, 09.313	Engineering Graphics I, II, III	6
.321, 10.322, 10.323	Calculus II, III, IV	6

Third Year

.321, 01.322, 01.323	Introduction to Structures I, II, III	6
.341, 01.342, 01.343	Fluid Mechanics I, II, III	6
.321, 02.322, 02.323	Stress Analysis I, II, III	6
.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6

Fourth Year

.324, 01.325, 01.326	Structural Analysis I, II, III	6
.331, 01.332, 01.333	Design of Structures I, II, III	6
.361, 01.362, 01.363	Materials and Soil Mechanics I, II, III	6
.371, 01.372, 01.373	Reinforced Concrete Design I, II, III	6

Total A.E. degree 96

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

Surveying and Highway Engineering Technology

Leading to the Degree of Associate in Engineering

The program in Surveying and Highway Engineering Technology prepares the graduate to assume responsibilities related to the preparation and calculation of preliminary and legal surveys required for both small projects such as subdivision work, individual lot layouts, and highway layouts as well as more complex projects relating to sewer systems, pipelines, power transmission lines dams, reservoirs, and aqueducts. Employment opportunities are with independent surveying companies; civil engineering companies; highway, transit, and railroad planning groups, as well as cartographers, construction companies, and contractors.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

First Year

Course Number	Course	Q.H
10.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12

Second Year

01.301, 01.302, 01.303	Surveying I, II, III	6
02.301, 02.302, 02.303	Mechanics (Statics) I, II, III	6
09.311, 09.312, 09.313	Engineering Graphics I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6

Third Year

01.304, 01.305, 01.306	Advanced Surveying I, II, III	6
01.341, 01.342, 01.343	Fluid Mechanics I, II, III	6
02.321, 02.322, 02.323	Stress Analysis I, II, III	6
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6

Fourth Year

01.307, 01.308, 01.309	Legal Aspects of Surveying I, II, III	6
01.311, 01.312, 01.313	Highway Engineering I, II, III	6
01.361, 01.362, 01.363	Materials and Soil Mechanics I, II, III	6
01.371, 01.372, 01.373	Reinforced Concrete Design I, II, III	6

Total A.E. degree 96

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

Civil Engineering Technology

candidate for Accreditation by Engineers' Council for Professional Development subject to annual review)

Leading to the Degree of Bachelor of Engineering Technology

The program in Civil Engineering Technology prepares the graduate to assume broad responsibilities related to surveys required to develop initial design criteria and specifications, and to become involved in the planning, design, and construction of all kinds of relatively permanent structures, municipal plants and systems, or transportation systems and facilities. Employment opportunities exist in private consulting firms, construction companies, and public works agencies. Work involving surveying, design, and supervision is open to graduates.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

First Year

Course Number	Course	Q.H.
307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
317, 11.318, 11.319	Physics I, II, III	12

Second Year

301, 01.302, 01.303	Surveying I, II, III	6
311, 09.312, 09.313	Engineering Graphics I, II, III	6
321, 10.322, 10.323	Calculus II, III, IV	6
601, 30.602	*Composition and Rhetoric I, II	4
	English Elective	2

Third Year

.304, 01.305, 01.306	Advanced Surveying I, II, III	6
.301, 02.302, 02.303	Mechanics (Statics), I, II, III	6
.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
	**Laboratory	6

Fourth Year

.341, 01.342, 01.343	Fluid Mechanics I, II, III	6
.321, 01.322, 01.323	Introduction to Structures I, II, III	6
.321, 02.322, 02.323	Stress Analysis I, II, III	6
.501, 23.502, 23.503	†Western Civilization I, II, III	6

Fifth Year

.324, 01.325, 01.326	Structural Analysis I, II, III	6
.544, 12.545, 12.546	††General Chemistry I, II, III	6
.501, 39.502, 39.503	Economic Principles and Problems I, II, III	6
.331, 01.332, 01.333	Design of Structures I, II, III	6

30.603 Composition and Rhetoric (Intensive) may be substituted for 30.601, 30.602 Composition and Rhetoric I, II.

Six quarter hours of laboratory work is required, see selection titled "Civil Engineering Laboratories."

10.324, 10.325, 10.326 Differential Equations I, II, III is recommended for all students planning advanced engineering technology subjects.

23.509, 23.510 Western Civilization A, B (6 q.h.) may be substituted for 23.501, 23.502, 23.503 Western Civilization I, II, III.

Students may elect to add 12.547, 12.548, 12.549 Gen. Chem. Laboratory I, II, III (3 q.h.)

Sixth Year

01.371, 01.372, 01.373	Reinforced Concrete Design I, II, III	6
01.361, 01.362, 01.363	Materials and Soil Mechanics I, II, III	6
19.501, 19.502, 19.503	†Psychology I, II, III	6
	*Elective I, II, III	6

Seventh Year

01.311, 01.312, 01.313	Highway Engineering I, II, III	6
	Elective I, II, III (Technical)	6
	*Elective I, II, III	6

Eighth Year

01.351, 01.352, 01.353	Environmental Engineering I, II, III	6
30.604, 30.605	†Introduction to Literary Forms I, II	4
	English Elective	2
	*Elective I, II, III	6

Total B.E.T. degree 180

Suggested Electives

01.307, 01.308, 01.309	Legal Aspects of Surveying I, II, III	6
01.327, 01.328, 01.329	Advanced Structural Analysis I, II, III	6
01.334, 01.335, 01.336	Advanced Structural Design I, II, III	6
01.401, 01.402	Technology of Modern Architecture I, II	4
01.390	Construction Administration	2
18.511, 18.512, 18.513	Biology	12
18.521, 18.522, 18.523	Microbiology	12

Civil Engineering Laboratories

01.310	Surveying Laboratory	2
01.364	Materials & Soil Mechanics Laboratory	2
01.380, 01.381, 01.382	Environmental Laboratory I, II, III	6

Elective courses for which proper preparation exists may be chosen from within or outside of the Civil Engineering discipline.

Transfer students may petition for elective credits for courses that are suitable to the curriculum.

Graduates of the Bachelor of Engineering Technology programs desiring to pursue programs leading to the Bachelor of Science in Engineering degree at Northeastern University may apply through the Admissions Department (153 R). Programs in Electrical, Civil, and Mechanical Engineering are available on a part-time as well as a regular cooperative program. Industrial and Chemical Engineering programs are available only during the regular day programs.

Candidates must have at least 2.75 cumulative average and complete the course program prescribed by the major department and the Dean's office.

*Before registering for any electives, the student should submit a proposed program of elective courses — preferably representing a minor field of concentration consistent with his personal career objectives — for approval by the Academic Standing Committee. 10.324, 10.325, 10.326 Differential Equations I, II, III is recommended for all students planning advanced engineering technology subjects.

†30.606 Introduction to Literary Forms (Intensive) may be substituted for 30.604, 30.605 Introduction to Literary Forms.

‡19.508, 19.509 Fundamentals of Psychology (8 q.h.) may be substituted for 19.501, 19.502. 19.503 Psychology I, II, III.

ELECTRICAL ENGINEERING TECHNOLOGY PROGRAMS

Electrical Engineering deals with the design and operation of equipment and systems related to power, communications, data-processing, and electrical control. Its major functions are: 1) the generation, transmission and distribution of electrical energy for light and power purposes; 2) the development and production of equipment for telephone, radio, television, radar, and communication; 3) the design and construction of data-processing systems and analog or digital computers; and 4) the application of electrical and electronic devices in the control of processes and manufacture.

Employment opportunities for the Electrical Engineering Technology graduate are in public and private research laboratories, in engineering consulting groups dealing with industrial and plant applications, design organizations dealing with operation and manufacture, in sales engineering, and in the electric utility industry.

The Electrical Engineering Technology program and related programs offered by Lincoln College are:

Associate in Engineering Degree

Bioelectric Engineering Technology	page 92
Electrical Power Engineering Technology	page 74
Computer Engineering Technology	page 93
Electronics Engineering Technology	page 75

Post-Associate Degree Certificate

Control Systems Engineering Technology	page 94
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Bachelor of Engineering Technology Degree

Electrical Engineering Technology	pages 76-78
(Accredited by Engineer's Council for Professional Development)	

The program in Electrical Engineering Technology leading to the Bachelor of Engineering Technology is also offered as a day cooperative program. A specimen curriculum is shown on pages 79-80. For further information please call (617) 437-2200, or write.

The Dean of Admissions
Northeastern University
360 Huntington Avenue
Boston, Massachusetts 02115

Electrical Power Engineering Technology

Leading to the Degree of Associate in Engineering

The program in Electric Power Engineering Technology prepares the graduate to assume responsibilities related to the design, installation, operation, and maintenance of electrical machinery, power and control apparatus, and larger equipment employing heavy currents. The curriculum includes the study of the generation, transmission, and distribution of electrical energy for light and power, and the application and operation of electrical machinery in industry.

Employment opportunities are in public and investor-owned electrical utilities, electrical manufacturing companies, consulting engineering firms, control equipment design organizations, and communications companies.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

First Year

Course Number	Course	Q.H.
10.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12

Second Year

03.301, 03.302, 03.303	Circuit Theory I, II, III	6
09.307, 09.308, 09.309	Electrical and Electronic Graphics I, II, III	6
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6

Third Year

03.304, 03.305, 03.306	Circuit Theory IV, V, Electrical Measurements	6
03.346, 03.347, 03.348	Electronics for Industry I, II, III	6
03.331, 03.332, 03.333	Energy Conversion I, II, III	6
	Technical Elective I, II, III	6

Fourth Year

03.334, 03.335, 03.336	Control Circuits I, II, III	6
03.337, 03.338, 03.339	Basic Power Systems I, II, III	12
03.341, 03.342, 03.343	Power and Control Labs. I, II, III	6

Total A.E. degree 96

Suggested Technical Electives

04.381, 04.382, 04.383	Nuclear Technology I, II, III	6
02.351, 02.352, 02.353	Thermodynamics I, II, III	6

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

Electronics Engineering Technology*Leading to the Degree of Associate in Engineering*

The program in Electronic Engineering Technology prepares the graduate to assume responsibilities related to the design, development, and operation of communications, data-processing, and electronic control equipment for applications in computers, military and space explorations, and in automated industrial production equipment. Employment opportunities are in communications equipment, electrical manufacturing, data-processing and control, equipment organizations, as well as other engineering oriented companies.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

First Year

Course Number	Course	Q.H.
0.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
1.317, 11.318, 11.319	Physics I, II, III	12

Second Year

3.301, 03.302, 03.303	Circuit Theory I, II, III	6
9.307, 09.308, 09.309	Electrical and Electronic Graphics I, II, III	6
0.321, 10.322, 10.323	Calculus II, III, IV	6
1.321, 11.322, 11.323	Wave Phenomena, Semiconductor Physics, Semiconductor Devices	6

Third Year

3.304, 03.306, 03.323	Circuit Theory IV, Electrical Measurements, Electronic Lab.	6
3.311, 03.312, 03.313	Electronics I, II, III	12
9.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6

Fourth Year

3.314, 03.315, 03.316	Pulse and Digital Circuits I, II, III	6
3.317, 03.318, 03.319	Principles of Communication Systems I, II, III	12
3.327, 03.328, 03.329	Advanced Electronic Lab. I, II, III	6

Total A. E. degree 96

NOTE: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

03.387, 03.388, 03.389 Active Integrated Circuits I, II, III
plus

03.381, 03.382, 03.383 Transistor-Circuit Engineering I, II, III
may be substituted for 03.317, 03.318, 03.319 Principles of Communication Systems I, II, III.

Electrical Engineering Technology

(Accredited by — Engineers' Council for Professional Development)

Leading to the Degree of Bachelor of Engineering Technology

The program in Electrical Engineering Technology prepares the graduate to assume broad responsibilities related to the design, development, operation, installation, and production of a wide variety of electrical and electronic equipment concerned with the generation and utilization of electric energy, communications, data-processing, and industrial control. Employment opportunities are in public and private research laboratories, engineering consulting firms dealing with industrial and plant applications, electric utilities, electrical and electronic organizations concerned with operation and manufacture as well as installation and sales.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

First Year

Course Number	Course	Q.H.
10.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12

Second Year

03.301, 03.302, 03.303	Circuit Theory I, II, III	6
09.307, 09.308, 09.309	Electrical and Electronic Graphics I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6
30.601, 30.602	*Composition and Rhetoric I, II	4
	English Elective	2

Third Year

03.304, 03.305, **03.306	Circuit Theory IV, V, and Electrical Measurements	6
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
10.324, 10.325, 10.326	Differential Equations, I, II, III	6
11.321, 11.322, 11.323	Wave Phenomena, Semiconductor Physics, Semiconductor Devices	6

Fourth Year

03.311, 03.312, 03.313	Electronics I, II, III	12
†03.324, 03.325, 03.323	Circuits Laboratory I, II and Electronic Lab.	6
03.331, 03.332, 03.333	Energy Conversion I, II, III	6

*30.603 Composition and Rhetoric (Intensive) may be substituted for 30.601, 30.602 Composition and Rhetoric I, II.

**Electronically oriented students may replace 03.305 Circuit Theory V, with the technical course provided (see current schedule).

†03.324, 03.325 Circuits Laboratory is required for students having no previous degrees. Transfer students with an Associates degree will be assigned to a projects laboratory.

Fifth Year

3.317, 03.318, 03.319	Principles of Communication Systems	12
3.361, 03.362, 03.363	Transients in Linear Systems I, II, III	6
3.501, 23.502, 23.503	*Western Civilization I, II, III	6

Sixth Year

3.327, 03.328, 03.329	Advanced Electronic Lab. I, II, III	6
3.371, 03.372, 03.373	Analog, Digital and Hybrid Computers I, II, III	6
9.501, 39.502, 39.503	Economic Principles and Problems I, II, III	6
	* Elective I, II, III	6

Seventh Year

3.377, 03.378, 03.379	Control Systems I, II, III	6
9.501, 19.502, 19.503	†Psychology I, II, III	6
	* Elective I, II, III	6

Eighth Year

0.604, 30.605	‡Introduction to Literary Forms I, II	4
	English Elective	2
	* Elective I, II, III	6
	* Elective I, II, III	6
	Total B.E.T. degree	180

Suggested Technical Electives

Q.H.

3.314, 03.315, 03.316	Pulse and Digital Circuits I, II, III	6
3.337, 03.338, 03.339	Basic Power Systems I, II, III	12
3.341, 03.342, 03.343	Power & Control Labs I, II, III	6
3.364, 03.365, 03.366	Advanced Circuit Theory I, II, III	6
3.367, 03.368, 03.369	Advanced Pulse & Digital Circuits, I,II, III	6
3.374, 03.375, 03.376	Digital Systems I, II, III	6
3.381, 03.382, 03.383	Linear Active Circuit Design I, II, III	6
3.384, 03.385, 03.386	Microwave Semiconductor Devices and Circuits I, II, III	6
3.387, 03.388, 03.389	Integrated Circuits I, II, III	6
9.354, 09.355, 09.356	Computer Systems I, II, III	6
9.357, 09.358, 09.359	Computer Aided Design I, II, III	6
9.361, 09.362, 09.363	Computer Controlled Systems I, II, III	6
3.360	Introduction to Radar Systems	4
1.324	Introductory Survey of Lasers	2

^a23.509, 23.510 Western Civilization A, B may be substituted for 23.501, 23.502, 23.503
Western Civilization I, II, III.

*Before registering for any electives, the student should submit a proposed program of elective courses — preferably representing a minor field of concentration consistent with his personal career objectives — for approval by the Committee on Education.

10.351, 10.352, 10.353 Advanced Mathematics I, II, III is recommended for all students planning advanced engineering technology subjects.

*03.387, 03.388, 03.389 Integrated Circuits I, II, III

plus

03.381, 03.382, 03.383 Linear Active Circuit Design I, II, III.

may be substituted for 03.317, 03.318, 03.319 Principles of Communication Systems I, II, III.

†19.508, 19.509 Fundamentals of Psychology I, II (8 q.h.) may be substituted for 19.501, 19.502, 19.503 Psychology I, II, III (6 q.h.)

‡30.606 Introduction to Literary Forms (Intensive) may be substituted for 30.604, 30.605
Introduction to Literary Forms I, II.

Electrical Engineering Technology courses of elective nature may be chosen from the above list of courses.

Elective courses for which proper preparation exists may be chosen from within or outside of the electrical engineering discipline.

Graduates of the Bachelor of Engineering Technology program desiring to pursue programs leading to the Bachelor of Science in Engineering degree at Northeastern University may apply through the Admissions Department (150RI). Programs in Electrical, Civil, and Mechanical Engineering are available on a part-time as well as a regular cooperative program. Industrial, and Chemical Engineering programs are available only during the regular day programs.

Candidates must have at least a 2.75 cumulative average and complete a course program prescribed by the major department and the Dean's office.

Electrical Engineering Technology

(Day Cooperative Curriculum)

Leading to the Degree of Bachelor of Engineering Technology

(The first four years of this program are being offered during 1974-75, quarters 1 through 9.)

First Year

Course Number	Course	Q.H.
0.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
1.317, 11.318, 11.319	Physics I, II, III	12
0.113	Freshman Writing	4
30.114, 30.115	Introduction to Lit., Great Themes in Lit.	8
9.421, 09.422, 09.423	Principles of Computer Programming I, II, III	6
9.461, 09.462, 09.463	Engineering Design Graphics I, II, III	6
11.373, 11.374	Physics Lab. I, II	2

Second Year

0.421, 10.422	Calculus A, B	8
3.451, 03.452	Circuit Analysis I, II	8
1.420	Physics IV	4
03.440	Physical Electronics	4
03.324	Circuits Laboratory I	2
	Liberal Arts Elective I, II	8

***Third Year**

3.460	Engineering Analysis I	4
03.430	Energy Conversion	4
3.453, 03.454	Circuit Analysis III, IV	8
3.311, 03.312	Electronics I, II	8
9.115	Principles of Economics	4
03.410	Electrical Measurements	4
3.325, 03.323	Circuits Lab. II, Electronic Lab.	4

Fourth Year

3.470	Digital Computers	4
03.477	Control Engineering	4
3.313	Electronics III	4
3.327, 03.328	Advanced Electronic Lab. I, II	4
	**Technical Elective (A or B) I, II	8
	Liberal Art Elective II	4

*Note: Students desiring to terminate their program at the end of quarter 7 may petition to be awarded the Associate in Engineering degree.

*Technical Elective A: Power Systems Sequence

Technical Elective B: Communication Engineering Sequence (See next page).

Fifth Year

Course Number	Course	Q.H.
03.478	Control Engineering II	4
03.437	Distrb. Systems	4
03.329	Advanced Electronic Lab. III	2
03.461	Engineering Analysis II or	4
02.411	Mechanics A Liberal Art Elective	8
	*Technical Elective (A or B) III	4
	Technical Elective	4
	Total B.E.T. degree	178 Q.H.

TECHNICAL ELECTIVE SEQUENCES

Power Systems Sequence		
03.337	Basic Power Systems I	4
03.338	Basic Power Systems II	4
03.339	Basic Power Systems III	4
	Technical Elective (Selected from below)	4
Communication Engineering Sequence		
03.317	Principles of Communication Systems I	4
03.318	Principles of Communication Systems II	4
03.319	Principles of Communication Systems III	4
	Technical Elective (selected from below)	4
<i>Suggested Technical Electives</i>		
03.317	Principles of Communication Systems I	4
03.337	Basic Power Systems I	4
03.490	Optical Instrumentation	4
04.481	Nuclear Technology	4

Graduates of the Day Bachelor of Engineering Technology program who have maintained a superior level of achievement and who wish to continue their academic studies may be qualified to enter the part time or full time program leading to the Bachelor of Science in Engineering. For further information contact the Lincoln College office at 219 Hayden Hall, telephone 437-2500.

MECHANICAL ENGINEERING TECHNOLOGY PROGRAMS

Mechanical Engineering deals with the harnessing of power resources by means of machinery to perform useful work. In contrast to civil engineering which deals primarily with static forces and structures, mechanical engineering is more concerned with the motion and kinetics of devices which are activated by hydraulic, electrical, mechanical, or thermodynamic forces. Major functions of the mechanical engineer are: 1) design and installation of all kinds of machinery from pocket watches to the largest of steel boring mills; 2) development and production of engines and transportation equipment (automobile, aircraft, ship, railway, etc.); 3) construction and operation of furnaces and boilers as well as heating and air-conditioning equipment for the control of atmospheric and environmental conditions.

Employment opportunities for Mechanical Engineering Technology graduates are in the areas of 1) research, design, or development; 2) production, operation, testing, or control and 3) installation, maintenance, and sales. In performing these functions, graduates will work in close association with professionals in the field and may develop technologically to junction independently and in positions of managerial responsibility.

The Mechanical Engineering Technology program and related programs offered by Lincoln College are:

Associate in Engineering Degree

Mechanical Engineering Technology	page 82
Electrical Engineering Technology	page 83

Bachelor of Engineering Technology Degree

Mechanical Engineering Technology (Accredited by Engineers' Council for Professional Development)	pages 84-85
Mechanical-Structural Engineering Technology	pages 97-98

The program in Mechanical Engineering Technology leading to the Bachelor of Engineering Technology is also offered as a day cooperative program. A specimen curriculum is shown on pages 86 and 87. For further information please call (617) 437-2200, or write.

The Dean of Admissions
Northeastern University
360 Huntington Avenue
Boston, Massachusetts 02115

Mechanical Engineering Technology

Leading to the Degree of Associate in Engineering

The program in Mechanical Engineering Technology prepares the graduate to assume responsibilities related to the design, production, and installation of mechanical tools, machinery, engines, and transportation equipment in which there is an intermingling of mechanical and hydraulic forces. Because of the increased mechanization of all industry, varied employment opportunities are available in private engineering consultant groups, and in light and heavy industries, as well as almost all engineering design organizations.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

First Year

Course Number	Course	Q.H.
10.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12

Second Year

02.301, 02.302, 02.303	Mechanics (Statics) I, II, III	6
09.311, 09.312, 09.313	Engineering Graphics I, II, III	6
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6

Third Year

02.304, 02.305, 02.306	Mechanics (Dynamics) I, II, III	6
02.321, 02.322, 02.323	Stress Analysis I, II, III	6
*02.341, 02.342, 02.343	Materials I, II, III	6
09.314, 09.315, 09.316	Engineering Design I, II, III	6

Fourth Year

01.341, 01.342, 01.343	Fluid Mechanics I, II, II	6
02.324, 02.325, 02.326	Advanced Stress Analysis I, II, III	6
02.327, 02.328, 02.329	Mechanical Design I, II, III	6
02.331, 02.332, 02.333	Mechanical Technology Lab. I, II, III	6

Total A.E. degree 96

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

*03.320, 03.321, Electricity and Electronics I, II, III, may be substituted for 02.341, 02.342
02.343 Materials I, II, III.

Heat Engineering Technology*Leading to the Degree of Associate in Engineering*

The program in Heat Engineering Technology prepares the graduate to assume responsibilities related to the design, operation, and construction of engines and equipment in which there are thermodynamic, hydraulic, and mechanical forces. Typical examples are automobile, aircraft, and ship engines; boilers and furnaces; as well as heating, air conditioning, and ventilating devices. Employment opportunities are with architectural firms, engineering consultants, light and heavy mechanical industries, as well as other engineering oriented organizations.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

First Year

Course Number	Course	Q.H.
10.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12

Second Year

10.301, 02.302, 02.303	Mechanics (Statics) I, II, III	6
10.311, 09.312, 09.313	Engineering Graphics I, II, II	6
10.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6

Third Year

10.304, 02.305, 02.306	Mechanics (Dynamics) I, II, III	6
10.321, 02.322, 02.323	Stress Analysis I, II, III	6
10.351, 02.352, 02.353	Thermodynamics I, II, III	6
10.314, 09.315, 09.316	Engineering Design I, II, III	6

Fourth Year

10.341, 01.342, 01.343	Fluid Mechanics I, II, III	6
10.354, 02.355, 02.356	Heat Transfer I, II, III	6
10.357, 02.358, 02.359	Heat Engineering I, II, III	6
10.361, 02.362, 02.363	Heat Technology Lab. I, II, III	6

Total A.E. Degree 96

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

Mechanical Engineering Technology

(Accredited by Engineers' Council for Professional Development)

Leading to the Degree of Bachelor of Engineering Technology

The program in Mechanical Engineering Technology prepares the graduate to assume broad responsibilities related to the design, development, production operation, and installation of all kinds of machinery, engines, and transportation equipment as well as boilers, furnaces, and heating or air conditioning equipment, which involve interactions of mechanical, hydraulic, and thermodynamic forces. Employment opportunities are in industry producing mechanized and automated equipment, design and engineering organizations, and in companies dealing primarily with manufacture and production.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

First Year

Course Number	Course	Q.H
10.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12

Second Year

09.311, 09.312, 09.313	Engineering Graphics I, II, II	6
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6
30.601, 30.602	*Composition and Rhetoric I, II English Elective	4 2

Third Year

02.301, 02.302, 02.303	Mechanics (Statics) I, II, III	6
02.341, 02.342, 02.343	Materials I, II, III	6
09.314, 09.315, 09.316	Engineering Design I, II, III	6
**Elective I, II, III		6

Fourth Year

01.341, 01.342, 01.343	Fluid Mechanics I, II, III	6
02.304, 02.305, 02.306	Mechanics (Dynamics) I, II, III	6
02.321, 02.322, 02.323	Stress Analysis I, II, III	6
23.501, 23.502, 23.503	†Western Civilization I, II, III	6

*30.603 Composition and Rhetoric (Intensive) may be substituted for 30.601, 30.602 Composition and Rhetoric I, II.

**Before registering for any electives, the student should submit a proposed program of elective courses — preferably representing a minor field of concentration consistent with his personal career objectives — for approval by the Academic Standing Committee.

10.324, 10.325, 10.326 Differential Equations I, II, III is recommended for all students planning advanced engineering technology subjects.

†23.509, 23.510 Western Civilization A, B (6 q.h.) may be substituted for 23.501, 23.502
23.503 Western Civilization I, II, III.

Fifth Year

.324, 02.325, 02.326	Advanced Stress Analysis I, II, III	6
.351, 02.352, 02.353	Thermodynamics I, II, III	6
.381, 04.382, 04.383	Nuclear Technology I, II, III	6
.501, 39.502, 39.503	Economic Principles and Problems I, II, III	6

Sixth Year

.327, 02.328, 02.329	Mechanical Design I, II, III	6
.354, 02.355, 02.356	Heat Transfer I, II, III	6
.501, 19.502, 19.503	*Psychology I, II, III	6
	**Elective I, II, III	6

Seventh Year

.331, 02.332, 02.333	Mechanical Technology Lab. I, II, III	6
.357, 02.358, 02.359	Heat Engineering I, II, III	6
	**Elective I, II, III	6

Eighth Year

.361, 02.362, 02.363	Heat Technology Lab. I, II, III	6
604. 30.605	†Introduction to Literary Forms I, II	4
	English Elective	2
	**Elective I, II, III	6

Total B.E.T. degree 180

Suggested Technical Electives

Q.H.

337, 02.338, 02.339	Mechanical Vibrations I, II, III	6
320, 03.321, 03.322	Electricity and Electronics I, II, III	6
334, 02.335, 02.336	Experimental Stress Analysis I, II, III	6
344, 02.345, 02.346	Applied Metallurgy I, II, III	6
347	Principles of Aerodynamics	4

Transfer students may petition for elective credits for courses that are suitable the curriculum.

Graduates of the Bachelor of Engineering Technology program desiring to sue programs leading to the Bachelor of Science in Engineering degree at rtheastern University may apply through the Admissions Department (150 RI). ograms in Electrical and Civil Engineering are available on a part-time as well a regular cooperative program. Industrial, Chemical and Chemical Engineer-; programs are available only during the regular day programs.

Candidates must have at least a 2.75 cumulative average and complete a urre program prescribed by the major department and the Dean's office.

19.508, 19.509 Fundamentals of Psychology I, II (8 q.h.) may be substituted for 19.501, 19.502, 19.503 Psychology I, II, III.

Elective courses for which proper preparation exists may be chosen from within or outside of the Mechanical Engineering discipline.

30.606 Introduction to Literary Forms (Intensive) may be substituted for 30.604, 30.605 ntroduction to Literary Forms I, II.

Mechanical Engineering Technology

(Day Cooperative Curriculum)

Leading to the Degree of Bachelor of Engineering Technology(The first four years of this program are being offered during 1974-75
quarters 1 through 9.**First Year**

Course Number	Course	Q.H
10.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12
30.113	Freshman Writing	4
30.114, 30.115	Introduction to Lit., Great Themes in Lit.	8
09.421, 09.422, 09.423	Principles of Computer Programming I, II, III	6
09.461, 09.462, 09.463	Engineering Design Graphics I, II, III	6
11.373, 11.374	Physics Lab. I, II	2

Second Year

10.421, 10.422	Calculus A, B	8
02.411, 02.412	Mechanics A, B	8
09.464	Engineering Design Graphics IV	4
02.414	Stress Analysis A	4
02.461	Machine Shop (or Liberal Art elective on petition with experience)	4
02.431	Materials A	4

***Third Year**

02.413	Mechanics C	4
03.420	Electricity & Electronics I	4
02.415	Stress Analysis B	4
02.465	Heat Lab. I	2
02.462	Mechanical Lab. I	2
02.421, 02.422	Thermodynamics A, B	8
93.115	Principles of Economics	4
02.441	Fluid Mechanics A	4

Fourth Year

02.417, 02.418	Mechanical Design A, B	4&5
02.463, 02.464	Mechanical Lab. II, III	4
02.442	Fluid Mechanics B	2
02.423	Thermodynamics C	4
	Technical Elective I, II	8
	BA Elective or Industrial Engineering Elect. I	4
	Liberal Art Elective II	4

*NOTE: Students desiring to terminate their program at the end of quarter
may petition to be awarded the Associate in Engineering degree.

Fifth Year

Course Number	Course	Q.H.
4.481 02.467	Nuclear Technology	4
	Project Lab.	4
2.466	Heat Lab. II	2
2.424	Technical Elective II	4
	Thermodynamics D	2
	Technical Elective I, II	8
	Liberal Art Elective I, II	8
	Total B.E.T. degree	178

Technical Electives Must Be Chosen From the Following List

2.416	Stress Analysis C	4
2.452	Exp. Stress Analysis	4
2.451	Mech. Vibrations	4
2.432	Materials B	4
2.433	Applied Metallurgy	4
2.425	Thermodynamics E	4
2.423	Differential Equations	4
3.421	Elect. & Electronics 2	4
3.490	Optical Instrumentation	4

Graduates of the Day Bachelor of Engineering Technology program who have maintained a superior level of achievement and who wish to continue their academic studies may be qualified to enter the part-time or full-time program leading to the Bachelor of Science in Engineering. For further information contact the Lincoln College office at 219 Hayden Hall, telephone 437-2500.

INTERDISCIPLINARY ENGINEERING AND SCIENCE TECHNOLOGY PROGRAMS

These programs offered by Lincoln College present a variety of interdisciplinary combinations of the Engineering Technology Programs and the Science Programs (chemistry, physics, and mathematics). They have been developed to meet the need for technologists in the areas of ecology, bioelectronic devices, computer systems, and other technological applications requiring an expertise in several of the academic disciplines.

This demand for multi-skilled technologists reflects the increased reliance of society on the science and engineering technologist to help solve its growth problems. Opportunities are also developing in the highly interdisciplinary fields such as ocean engineering, bioengineering, environmental science, and public health.

The programs are designed to prepare the student to meet the challenge of interfacing technology and society. The engineering technology student not only learns about the disciplines that are related to his expertise but he also becomes oriented in the disciplines where his technological skills will be applied. A program of concentrated study in chemistry and physics or mathematics and physics is offered to the science technology student.

Lincoln College is also offering an Associate in Science Degree Program in Fire Technology which offers a broad spectrum of those scientific technologies which are basic in coping with fire fighting problems attendant to the complexities of today's society.

Interdisciplinary Engineering and Science Technology Programs offered to Lincoln College Students are:

Associate in Science Degree

Chemical-Physical Technology	page 8
Mathematical-Physical Technology	page 9
Fire Technology	page 9

Associate in Engineering Degree

Bioelectronic Engineering Technology	page 9
Computer Engineering Technology	page 9

Post-Associate Degree Certificate

Control Systems Engineering Technology	page 9
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Bachelor of Engineering Technology Degree

Environmental Control Technology	pages 95-96
Mechanical-Structural Engineering Technology	pages 97-98

Chemical-Physical Technology*Leading to the Degree of Associate in Science*

The program in Chemical-Physical Technology prepares the graduate to assume responsibilities related to the analysis, synthesis, and production of products involving chemical as well as physical changes. The curriculum provides both theoretical and laboratory training in the traditional branches of chemistry but also includes modern instrumental, radiochemistry, and nuclear technology. It provides broad rather than specialized training so as to have applicability in many chemistry-related fields. Employment opportunities are in manufacturing and pharmaceutical plants producing drugs, oils, synthetics, and plastics; as well as in private and industrial research laboratories concerned with the development of processes, by-products, and new knowledge.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

First Year

Course Number	Course	Q.H.
0.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
1.304, 11.305, 11.306	General Physics I, II, III	6
2.544, 12.545, 12.546	General Chemistry I, II, III	6
2.547, 12.548, 12.549	General Chemistry Lab. I, II, III	3

Second Year

0.321, 10.322, 10.323	Calculus II, III, IV	6
2.521, 12.522, 12.523	Analytical Chemistry I, II, III	6
2.524, 12.525, 12.526	Analytical Chemistry Lab. I, II, III	6
0.601, 30.602	Composition and Rhetoric I, II	4
	English Elective	2

Third Year

2.531, 12.532, 12.533	Organic Chemistry I, II, III	6
2.534, 12.535, 12.536	Organic Chemistry Lab. I, II, III	6
1.331, 11.332, 11.333	Modern Physics I, II, III	6
0.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6

Fourth Year

2.541, 12.542, 12.543	Physical Chemistry I, II, III	6
12.551, 12.552, 12.553	Instrumental and Radiochemistry	6
04.381, 04.382, 04.383	Nuclear Technology I, II, III	6
	Elective I, II, III	6

Total A.S. degree 99

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

Mathematical-Physical Technology*Leading to the Degree of Associate in Science*

The program in Mathematical-Physical Technology is designed to establish a firm background in the concepts of physics and mathematics with sufficient chemistry to allow effective communication between technologist and professional. The intensity of courses introduces theoretical depth for concept development but places emphasis at the level of application and performance.

Graduates may serve as high-level technicians and laboratory assistants in such fields as environmental and space science. Working with the professional engineer or scientist, he may assist in performing intricate and detailed experiments; collect, organize, and reduce technical data to manageable form for analysis; or perform investigations requiring mathematical and scientific backgrounds. Opportunities exist in the wide spectrum of research and development organizations which deal in the physical, mathematical, and engineering sciences.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

First Year

Course Number	Course	Q.H.
10.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12

Second Year

10.321, 10.322, 10.323	Calculus II, III, IV	6
11.321, 11.322, 11.323	Wave Phenomena, Semiconductor Physics, Semiconductor Devices	6
12.544, 12.545, 12.546	General Chemistry I, II, III	6
12.547, 12.548, 12.549	General Chemistry Lab. I, II, III	3
30.661, 30.602	Composition & Rhetoric I, II	4
	English Elective	2

Third Year

09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
10.324, 10.325, 10.326	Differential Equations I, II, III	6
03.307, 03.308, 03.309	Electricity & Electronics I, II, III	6
	Technical Elective I, II, II	6

Fourth Year

10.351, 10.352, 10.353	Advanced Mathematics I, II, III	6
11.331, 11.332, 11.333	Modern Physics I, II, III	6
11.373, 11.374, 03.323	Physics Laboratory I, II, Electronics Lab.	6
	Elective I, II, III	6

Total A.S. degree 99

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

ire Technology*Leading to the Degree of Associate in Science*

The program in Fire Technology is designed to prepare students to assume responsibilities in such areas as fire investigation, industrial fire prevention and protection, and residential fire safety and prevention. A broad array of engineering technologies is an integral part of the student's program as a preparation for coping with new building techniques, present day industrial operations, and the related complexities of the fire services.

The curriculum includes 72 quarter hours of credit in science and mathematics including physics, chemistry, and basic engineering courses. The balance of 24 quarter hours is made up of professional courses taught by specialists in this field bringing to the program a real insight in fire science technology.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or Basic Mathematics I and II courses (10.330 and 10.331). The Mathematics Placement Test must be taken prior to registration.

First Year

Course Number	Course	Q.H.
0.327, 10.328, 10.329	Mathematics I, II, III	6
1.304, 11.305, 11.306	General Physics I, II, III	6
1.301, 91.302	Fire Protection Science, I, II	4
91.303	Chemical Behavior of Fire	2
2.507, 12.508, 12.509	Modern Chemistry I, II, III	6

Second Year

2.301, 02.302, 02.303	Mechanics (Statics) I, II, III	6
0.320, 10.321, 10.322	Calculus I, II, III	8
2.341, 02.342, 02.343	Materials I, II, III	6
91.304, 91.305	Fire Prevention I, II	4

Third Year

1.341, 01.342, 01.343	Fluid Mechanics I, II, III	6
2.321, 02.322, 02.323	Stress Analysis I, II, III	6
2.351	Thermodynamics I	2
03.344	Fundamentals of Electricity and Residential Power Circuits	2
03.345	Industrial Power Circuits	2
1.306, 91.307, 91.308	Fire Protection Systems I, II, III	6

Fourth Year

1.351	Environmental Engineering	2
09.311, 09.312	Engineering Graphics I, II	4
4.381, 04.382	Nuclear Technology I, II	4
91.312	Environmental Physiology	2
5.570, 45.571, 45.572	Electronic Data Processing I, II, III	6
1.309, 91.310, 91.311	Fire Operations I, II, III	6

Total A.S. degree 96

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

Bioelectronic Engineering Technology*Leading to the Degree of Associate in Engineering*

The program in Bioelectronics Engineering Technology prepares the graduate to assume responsibilities related to the design, installation, and operation of modern medical electronic devices used in the measurement, recording, and analysis of anatomical, physiological, and biochemical functions in humans and animals. The curriculum builds heavily on electronics theory, chemistry, and human physiology with emphasis on typical bioelectronic devices and their laboratory applications. Employment opportunities are in biological, chemical, physiological, and pharmaceutical research laboratories; in clinics and hospital in relation to medical diagnosis and patient care; as well as in industrial organizations concerned with the design, development, and production of the equipment.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

First Year

Course Number	Course	Q.H.
10.307, 10.308	College Algebra and Trigonometry I, II	8
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12

Second Year

03.301, 03.302, 03.303	Circuit Theory I, II, III	6
09.307, 09.308, 09.309	Electrical and Electronic Graphics, I, II, III	6
10.321, 10.322, 10.323	Calculus, II, III, IV	6
12.507, 12.508, 12.509	*Modern Chemistry I, II, III	6

Third Year

03.304, 03.306, 03.323	Circuit Theory IV, Electrical Measurements and Electronic Lab.	6
11.320	Semiconductor Physics and Devices	4
03.311, 03.312	Electronics I, II	8
18.507, 18.508, 18.509	Gross Anatomy and General Physiology I, II, III	6

Fourth Year

03.351, 03.352, 03.353	Bioelectronic Devices I, II, III	6
03.357, 03.358, 03.359	Bioelectronic Lab. I, II, III	6
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
	Technical Elective	6

Total A.E. degree 96

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

*Student may elect to substitute 12.544, 12.545, 12.546 General Chemistry and 12.547, 12.548, 12.549 General Chemistry Laboratory I, II, III (9 q.h.)

Computer Engineering Technology*Leading to the degree of Associate in Engineering*

The Computer Engineering Technology program is organized to provide the mathematical and technological background for understanding both the hardware and software aspects of computer systems. Graduates will be prepared as: a) programmers who translate engineering or scientific concepts into meaningful form for the computer; b) engineering technicians concerned with the development, specification, production, and operation of computer hardware; and c) applications technicians dealing with the interface of the computer with industrial process and control systems or data acquisition, reduction, and display systems.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

First Year

Course Number	Course	Q.H.
307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
317, 11.318, 11.319	Physics I, II, III	12

Second Year

321, 10.322, 10.323	Calculus II, III, IV	6
301, 03.302, 03.303	Circuit Theory I, II, III	6
307, 09.308, 09.309	Electrical & Electronic Graphics I, II, III	6
351, 09.352, 09.353	Princ. of Computer Programming I, II, III	6

Third Year

320	Semiconductor Physics & Devices and	4
03.311, 03.312	Electronics I, II	8
354, 09.355, 09.356	Computer Systems I, II, III	6
324, 10.325, 10.326	Differential Equations I, II, III	6

Fourth Year

323, 03.391, 03.392	Electronic Lab & Computer Technology Lab II, III	6
371, 03.372, 03.373	Analog, Digital and Hybrid Comps. I, II, III Any 2 of 4	6
387, 03.388, 03.389	Active Integrated Circuits I, II, III	6
357, 09.358, 09.359	Computer Aided Design I, II, III	6
361, 09.362, 09.363	Computer Controlled Systems I, II, III	6
351, 10.352, 10.353	Advanced Mathematics I, II, III	6

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

Control Systems Engineering Technology*Leading to a Certificate*

The program in Control Systems Engineering Technology is designed to provide electrical and electronic background required in the development of control equipment and systems related to the age of automation. Practicing engineers who wish to avoid technological obsolescence may keep abreast of current control practices. The program presumes graduation from either Associate in Engineering degree programs in Electrical Power or Electronic Engineering Technology or bachelor degree programs in a branch of engineering. A certificate will be awarded upon completion of 30 quarter hours of credit and a minimum overall Q.P.A. requirement of 1.8 in Lincoln College.

Required Courses

Course Number	Course	Q.H.
03.361, 03.362, 03.363	Transients in Linear Systems I, II, III	6
10.324, 10.325, 10.326	Differential Equations I, II, III	6

Full Year Elective Sequences

(Require completion of Transients in Linear Systems)

03.364, 03.365, 03.366	Advanced Circuit Theory I, II, III	6
03.367, 03.368, 03.369	Advanced Pulse and Digital Circuits I, II, III	6
03.371, 03.372, 03.373	Analog, Digital, and Hybrid Computers I, II, III	6
03.374, 03.375, 03.376	Digital Systems I, II, III	6
03.377, 03.378, 03.379	Control Systems I, II, III	6
03.381, 03.382, 03.383	Transistor Circuit Engineering I, II, III	6
03.384, 03.385, 03.386	Microwave Semiconductor Devices and Circuits I, II, III	6
03.387, 03.388, 03.389	Active Integrated Circuits I, II, III	6
03.314, 03.315, 03.316	Pulse and Digital Circuits I, II, III	6

Environmental Control Technology*Leading to the degree of Bachelor of Engineering Technology*

This program is designed to meet the increasing demand for qualified manpower to operate and maintain facilities and services which relate to the control of our environment. From air-sampling to water treatment and industrial waste control, graduates will take important positions now waiting to be filled.

The program is unique in its mixture of physical and physiological sciences. In addition, the student has the option of selecting technical electives which are oriented toward physical facilities or the study of the user of the facilities man.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

First Year

Course Number	Course	Q.H.
307, 10.308	College Algebra & Trig. I, II	8
10.320	Calculus I	4
317, 11.318, 11.319	Physics I, II, III	12

Second Year

601, 30.602	*Composition & Rhetoric I, II	4
511, 18.512, 18.513	Biology I, II, III	12
544, 12.545, 12.546	Gen. Chemistry I, II, III	6
547, 12.548, 12.549	Gen. Chem. Lab. I, II, III	3

Third Year

521, 12.522, 12.523	Analytical Chem., I, II, III	6
521, 18.522, 18.523	Microbiology I, II, III	12
301, 02.302, 02.303	Mechanics (Statics) I, II, III	6

Fourth Year

380, 01.381, 01.382	Environmental Lab. I, II, III	6
351, 09.352, 09.353	Principles of Computer Prog. I, II, III	6
341, 01.342, 01.343	Fluid Mechanics I, II, III	6
501, 23.502, 23.503	**Western Civilization I, II, III	6

Fifth Year

321, 10.322, 10.323	Calculus II, III, IV	6
311, 09.312, 09.313	Engineering Graphics I, II, III	6
561, 18.562, 18.563	Ecology I, II, III	6
321, 02.322, 02.323	Stress Analysis I, II, III	6

0.603 Composition and Rhetoric (Intensive) may be substituted for 30.601, 30.602 Composition and Rhetoric I, II.

3.509, 23.510 Western Civilization A, B (6 q.h.) may be substituted for 23.501, 23.502, 3.503 Western Civilization I, II, III.

Sixth Year

39.501, 39.502, 39.503	Economic Principles & Prob. I, II, III	6
02.341, 02.342, 02.343	Materials I, II, III	6
18.524, 18.525, 18.526	{ Tech. Elective } Human Anat. & Physiology, or	9
01.324, 01.325, 01.326	Structural Analysis	6
	LA Elective	6

Seventh Year

Course Number	Course	Q.H.
01.383, 01.384, 01.385	Public Health Engineering I, II, III	6
02.351, 02.352, 02.353	{ Tech. Elective } Thermodynamics or	6
01.331, 01.332, 01.333	Design of Structures	6
	LA Elective	6

Eighth Year

01.386, 01.387, 01.388	Environmental Design I, II, III	6
02.357, 02.358, 02.359	{ Tech. Elective } Heat Engineering or	6
01.371, 01.372, 01.373	Reinf. Concrete Design	6
	LA Elective	6

Total B.E.T. Degree 181 or 18

Transfer students may petition for elective credits for courses that are suitable to the curriculum.

Graduates of the Bachelor of Engineering Technology program desiring to pursue programs leading to the Bachelor of Science in Engineering degree at Northeastern University may apply through the Admissions Department (150 RI). Programs in Electrical, Civil, and Mechanical Engineering are available on part-time as well as a regular cooperative program. Industrial and Chemical Engineering programs are available only during the regular day programs.

Candidates must have at least a 2.75 cumulative average and complete course program prescribed by the major department and the Dean's Office.

Mechanical-Structural Engineering Technology

Candidate for Accreditation by Engineers' Council for Professional Development subject to annual review)

Leading to the Degree of Bachelor of Engineering Technology

The program in Mechanical-Structural Engineering Technology is interdisciplinary in that it prepares the graduate to assume responsibilities related both the planning and construction of relatively static structures such as buildings, bridges, docks, etc., and also the design and production of dynamic machine tools, machinery, and other mechanical devices. The mechanical and structural content are integrated so as to be complementary and to provide a broad base for design problems of great variety. Employment opportunities lie in the architectural, construction, civil, and mechanical professions and companies.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

First Year

Course Number	Course	Q.H.
.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
.317, 11.318, 11.319	Physics I, II, III	12

Second Year

.311, 09.312, 09.313	Engineering Graphics I, II, III	6
.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
.321, 10.322, 10.323	Calculus II, III, IV	6
.601, 30.602	*Composition and Rhetoric I, II	4
	English Elective	2

Third Year

.301, 01.302, 01.303	Surveying I, II, III	6
.301, 02.302, 02.303	Mechanics (Statics) I, II, III	6
.314, 09.315, 09.316	Engineering Design I, II, III	6
	**Elective I, II, III	6

Fourth Year

.321, 01.322, 01.323	Introduction to Structures I, II, III	6
.304, 02.305, 02.306	Mechanics (Dynamics) I, II, III	6
.321, 02.322, 02.323	Stress Analysis I, II, III	6
.501, 23.502, 23.503	†Western Civilization I, II, III	6

30.603 Composition and Rhetoric (Intensive) may be substituted for 30.601, 30.602 Composition and Rhetoric I, II.

Before registering for any electives, the student should submit a proposed program of elective courses — preferably representing a minor field of concentration consistent with his personal career objectives — for approval by the Academic Standing Committee.

10.324, 10.325, 10.326. Differential Equations I, II, III is recommended for all students planning advanced engineering technology subjects.

23.509, 23.510 Western Civilization A, B may be substituted for 23.501, 23.502, 23.503 Western Civilization I, II, III.

Fifth Year

01.324, 01.325, 01.326	Structural Analysis I, II, III	6
01.341, 01.342, 01.343	Fluid Mechanics I, II, III	6
02.341, 02.342, 02.343	Materials I, II, III	6
39.501, 39.502, 39.503	Economic Principles and Problems I, II, III	6

Sixth Year

01.331, 01.332, 01.333	Design of Structures I, II, III	6
02.324, 02.325, 02.326	Advanced Stress Analysis I, II, III	6
19.501, 19.502, 19.503	*Psychology I, II, III	6
	**Elective I, II, III	6

Seventh Year

01.371, 01.372, 01.373	Reinforced Concrete Design I, II, III	6
02.327, 02.328, 02.329	Mechanical Design I, II, III	6
	**Elective I, II, III	6

Eighth Year

02.331, 02.332, 02.333	Mechanical Technology Lab. I, II, III	6
30.604, 30.605	†Introduction to Literary Forms I, II	4
	English Elective	2
	**Elective I, II, III	6

Total B.E.T. degree 180

Suggested Technical Electives

01.361, 01.362, 01.363	Materials and Soil Mechanics	6
02.337, 02.338, 02.339	Mechanical Vibrations I, II, III	6
01.327, 01.328, 01.329	Advanced Structural Analysis I, II, III	6
02.351, 02.352, 02.353	Thermodynamics I, II, III	6

Elective courses for which proper preparation exists may be chosen from within or outside of the Mechanical — Structural Engineering discipline.

Transfer students may petition for elective credits for courses that are suitable to the curriculum.

Graduates of the Bachelor of Engineering Technology Program desiring to pursue programs leading to the Bachelor of Science in Engineering degree at Northeastern University may apply through the Admissions Department (153 RI). Programs in Electrical, Civil, and Mechanical Engineering are available on a part time as well as a regular cooperative program. Industrial and Chemical Engineering programs are available only during the regular day programs.

Candidates must have at least a 2.75 cumulative average and complete a course program prescribed by the major department and the Dean's Office.

*19.508, 19.509 Fundamentals of Psychology I, II (8 q.h.) may be substituted for 19.501
19.502, 19.503 Psychology I, II, III.

**Before registering for any electives, the student should submit a proposed program of elective courses — preferably representing a minor field of concentration consistent with his personal career objectives — for approval by the Academic Standing Committee.

10.324, 10.325, 10.326 Differential Equations I, II, III is recommended for all student planning advanced engineering technology subjects.

†30.606 Introduction to Literary Forms (Intensive) may be substituted for 30.604, 30.605 Introduction to Literary Forms I, II.

description of courses

On the pages which follow is a numerical and descriptive listing of courses offered in the several curricula of Lincoln College. Although not all courses are offered every year, all will be offered during the normal period of each student's curriculum. The term "prerequisite" indicates a course that must be taken before undertaking the advanced course to which it applies.

A "quarter hour" equals approximately three clock hours of work (ordinarily, one hour of class and two hours of preparation a week for a quarter of 12 weeks' duration). Laboratory and drawing courses normally require fewer hours of outside preparation and therefore carry less credit than lecture courses.

Abbreviations

prereq. — prerequisite
coreq. — corequisite
cl. — class hours

lab. — laboratory hours
q.h. — quarter hours

Policy on Changes of Program

Lincoln College reserves the right to cancel, modify, or add to the courses offered or to change the order or content of courses in any curriculum.

The University further reserves the right to change the requirements for graduation, tuition, and fees charged, and other regulations. However, no change in tuition and fees at any time shall become effective until the school year following that in which it is announced.

Any changes which may be made from time to time relative to the above policy shall be applicable to all students in the school, college, or department concerned, including former students who may re-enroll.

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CIVIL ENGINEERING TECHNOLOGY

01.301 Surveying I (2 cl., 2 q.h.)

Surveying principles; theory of measurements; basic traverse computations.
Prereq. 10.308.

01.302 Surveying II (2 cl., 2 q.h.)

Stadia principles and topography; simple, compound, and vertical curves. Prereq. 01.301.

01.303 Surveying III (2 cl., 2 q.h.)

Spiral easement curves, earthwork computations; solution of the mass diagram. Prereq. 01.302.

01.304 Advanced Surveying I (1 cl., 2 lab., 2 q.h.)

Introduction to observations for latitude, time azimuth including basic spherical trigonometry. Prereq. 01.303.

1.305 Advanced Surveying II (1 cl., 2 lab., 2 q.h.)

precise leveling, triangulation and base line measurements. Use of the geodimeter and telurometer. *Prereq. 01.304.*

1.306 Advanced Surveying III (1 cl., 2 lab., 2 q.h.)

basic principles of photogrammetry and map making from aerial photographs. Map projections. *Prereq. 01.305.*

1.307 Legal Aspects of Surveying I (2 cl., 2 q.h.)

urveyor as an expert witness with emphasis on his knowledge of measurements; easements. Registry of Deeds procedure and how land is sold. *Prereq. 1.303.*

1.308 Legal Aspects of Surveying II (2 cl., 2 q.h.)

eeds and their essential elements, descriptions, and water rights. *Prereq. 1.307.*

1.309 Legal Aspects of Surveying III (2 cl., 2 q.h.)

and court procedure and the subdivision control law. *Prereq. 01.308.*

1.310 Surveying (2 cl., 2 q.h.)

n outdoor course in use of level, level circuit, vertical control, use of the anstis, taping exercises, closed traverse — transit-tape, horizontal control, photogrammetry — stadia and plane table, layout problems, horizontal and vertical curves, spiral easements. *Prereq. 01.303 (Summer Session).*

1.311 Highway Engineering I (2 cl., 2 q.h.)

engineering considerations in the planning and construction of modern highways and highway routing. *Prereq. 01.301.*

1.312 Highway Engineering II (2 cl., 2 q.h.)

ates of grade, superelevation, flexible and rigid pavements, and other features of highway design. *Prereq. 01.311.*

1.313 Highway Engineering III (2 cl., 2 q.h.)

traffic flow and traffic control. Computer applications to transportation problems. *Prereq. 01.312.*

1.321 Introduction to Structures I (1 cl., 2 lab., 2 q.h.)

raming plans and details for steel structures. *Prereq. 09.313 and 02.303.*

1.322 Introduction to Structures II (1 cl., 2 lab., 2 q.h.)

structural shop drafting and the evaluation of load capacities of rivets, welds, and bolts for structural connections using the AISC code. *Prereq. 01.321.*

1.323 Introduction to Structures III (1 cl., 2 lab., 2 q.h.)

esign and detailing of joints including standard connections, seats, and brackets. *Prereq. 01.322.*

1.324 Structural Analysis I (2 cl., 2 q.h.)

actions, shears, bending moments, and forces developed by loads on beams and trusses. Analytical and graphical methods. *Prereq. 02.323.*

1.325 Structural Analysis II (2 cl., 2 q.h.)

influence lines for beams, girders, and trusses. Solutions for forces from moving load systems on statically determinate structures. *Prereq. 01.324.*

01.326 Structural Analysis III (2 cl., 2 q.h.)

Introduction to classical methods of deflection solutions of beams and trusses
Methods of solving statically indeterminate structures. *Prereq.* 01.325.

01.327 Advanced Structural Analysis I (2 cl., 2 q.h.)

Analysis of indeterminacy and instability. Analysis of statically indeterminate structures using Castigliano, virtual work, methods of deflections, and the neutral point methods. *Prereq.* 01.326.

01.328 Advanced Structural Analysis II (2 cl., 2 q.h.)

Analysis of statically indeterminate structures using the column analogy, moment, area, elastic weights, and conjugate structures. *Prereq.* 01.327.

01.329 Advanced Structural Analysis III (2 cl., 2 q.h.)

Analysis of statically indeterminate structures using Williot-Mohr, slope deflection, and moment distribution. *Prereq.* 01.328.

01.331 Design of Structures I (2 cl., 2 q.h.)

Design of steel members in structural frames. Tension, compression, bending, and eccentrically loaded members. *Prereq.* 01.323 and 02.323.

01.332 Design of Structures II (2 cl., 2 q.h.)

Design of plate girders, highway bridge decks, and roof framing systems. *Pre-req.* 01.331.

01.333 Design of Structures III (2 cl., 2 q.h.)

Composite design in bridges and buildings. Introduction to plastic design methods in steel. *Prereq.* 01.332.

01.334 Advanced Structural Design I (2 cl., 2 q.h.)

Design of continuous frames in structural steel, moment resistant connections, and column bases. *Prereq.* 01.326, 01.333, 01.373.

01.335 Advanced Structural Design II (2 cl., 2 q.h.)

Design of continuous frames in reinforced concrete. Introduction to pre-stressed concrete member design. *Prereq.* 01.334.

01.336 Advanced Structural Design III (2 cl., 2 q.h.)

Design of foundations for structures. Spread footings, combined footings, mats and pile foundations. *Prereq.* 01.335.

01.341 Fluid Mechanics I (2 cl., 2 q.h.)

Hydrostatics; principles governing fluids at rest; pressure measurement; hydrostatic forces on submerged areas and objects; simple dams; fluids in moving vessels; hoop tension. *Prereq.* 02.303.

01.342 Fluid Mechanics II (2 cl., 2 q.h.)

Fluid dynamics; kinematics of flow; continuity, momentum, and energy equations; orifices; pi theorem; laminar and turbulent flow. *Prereq.* 01.341.

01.343 Fluid Mechanics III (2 cl., 2 q.h.)

Flow in closed conduits using Moody diagram; empirical formulae for closed conduit flow; minor losses; compound pipe systems; open channel flow and Manning formula; specific energy and stage relationships; fluid measurement systems. *Prereq.* 01.342.

1.351 Environmental Engineering (2 cl., 2 q.h.)

Principles of water supply engineering; population forecasting, quality and quantity of water for various uses. Water-treatment processes. Prereq. 01.343 and 2.546 or 12.509.

1.352 Environmental Engineering II (2 cl., 2 q.h.)

Collection and disposal of sewage and storm water. Modern methods of treatment and sewage-plant operation. Prereq. 01.351.

1.353 Environmental Engineering III (1 cl., 2 lab., 2 q.h.)

Layout and design of water-treatment and sewage treatment plants. Instrumentation and electrical equipment. Prereq. 01.352.

1.361 Materials and Soil Mechanics I

Physical properties of Portland cement, aggregates, mixing water, and admixtures. Proportioning of batches. Mixing, placing, and finishing of concrete. Bituminous materials. Prereq. 02.303.

1.362 Materials and Soil Mechanics II

Index properties, soil moisture, and structure. Compressibility, theory of consolidation. Prereq. 01.361.

1.363 Materials and Soil Mechanics III

Bearing strength of soils, stress analysis, settlement calculations. Lateral earth pressures, bearing capacity of shallow footings. Soil compaction, stabilization and site investigation. Prereq. 01.362.

1.364 Materials & Soil Mechanics Lab. (2 cl., 2 q.h.)

Rain size analysis, variables in concrete mix, bituminous testing, specific gravity — CBR optimum moisture, direct shear, consolidation, seepage and flow nets, use of triaxial equipment. Prereq. 01.363.

1.371 Reinforced-Concrete Design I (2 cl., 2 q.h.)

Design of bending members in reinforced concrete, using elastic and ultimate-strength theories. Prereq. 02.323.

1.372 Reinforced-Concrete Design II (2 cl., 2 q.h.)

Design of axially and eccentrically loaded columns by elastic and ultimate strength principles. Prereq. 01.371.

1.373 Reinforced-Concrete Design III (2 cl., 2 q.h.)

Reinforced-concrete design of basic structures including consideration of continuity. Prereq. 01.372.

1.380 Environmental Lab. I (3 lab., 2 q.h.)

Methods and techniques for the examination of water. Treatment efficiency is included for various types of water treatment.

1.381 Environmental Lab. II (3 lab., 2 q.h.)

Methods and techniques for the examination of wastewater and industrial waste discharges. Both chemical and bacteriological analysis are included.

1.382 Environmental Lab. III (3 lab., 2 q.h.)

Advanced methods of measuring impurities in air, water, and solid waste discharges.

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01.383 Public Health Engineering I (2 cl., 2 q.h.)

The principles and practice of public health engineering. Administrative and legal aspects of public health quality control.

01.384 Public Health Engineering II (2 cl., 2 q.h.)

Standard methods employed in public health evaluations of foods, dairy products, drinking water, shellfish, air, and recreational waters.

01.385 Public Health Engineering III (2 cl., 2 q.h.)

Engineering control of air pollution, refuse disposal, institutional sanitation, insect vectors, and rodent control.

01.386 Environmental Design I (2 cl., 2 q.h.)

Lecture and design problems in environmental quality, water resources, and waste treatment.

01.387 Environmental Design II (2 cl., 2 q.h.)

Lecture and design problems in wastewater treatment, chlorination, and water pollution control.

01.388 Environmental Design III (2 cl., 2 q.h.)

Lecture and design problems in air pollution control, solid waste disposal, and industrial waste disposal.

01.390 Construction Administration (2 cl., 2 q.h.)

Contract, specifications, and bidding procedures; estimating and scheduling, including the critical path method. Discussion of personnel administration and union negotiation. *Prereq. none.*

01.393 Architectural Design I (2 cl., 2 q.h.)

Study of proportion, composition, planning techniques, and spatial organization. *Prereq. 09.313.*

01.394 Architectural Design II (2 cl., 2 q.h.)

Orientation of structures, site organization, selection of building materials, and consideration of the building process. *Prereq. 01.398.*

01.395 Architectural Design III (2 cl., 2 q.h.)

Basic architectural design projects assigned by the instructor. *Prereq. 01.394.*

01.401 Technology of Modern Architecture I (2 cl., 2 q.h.)

General background of architectural styles both historical and contemporary with emphasis on engineering design aspects and construction procedures of various types of buildings. *Prereq. none.*

01.402 Technology of Modern Architecture II (2 cl., 2 q.h.)

Contemporary architecture, emphasizing the engineering design aspects and construction procedures required for modern buildings. *Prereq. none.*

MECHANICAL ENGINEERING TECHNOLOGY

02.301 Mechanics (Statics) I (2 cl., 2 q.h.)

Forces, moments, couples, statics of particles, and rigid bodies in two and three dimensions. *Prereq. 10.320 and 11.317.*

2.302 Mechanics (Statics) II (2 cl., 2 q.h.)

Distributed forces — external and internal. First moments and centroids. Analysis of structures — trusses, frames, and machines. Prereq. 2.301.

2.303 Mechanics (Statics) III (2 cl., 2 q.h.)

Friction, second moments, and virtual work. Prereq. 02.302.

2.304 Mechanics (Dynamics) I (2 cl., 2 q.h.)

Kinematics of particles — rectilinear and curvilinear motion of dynamic particles — force, mass and acceleration, work and energy. Prereq. 02.303.

2.305 Mechanics (Dynamics) II (2 cl., 2 q.h.)

Impulse and momentum of particles. Kinematics and dynamics of rigid bodies — force, mass and acceleration. Prereq. 02.304.

2.306 Mechanics (Dynamics) III (2 cl., 2 q.h.)

Dynamics of rigid bodies — work and energy, impulse and momentum. Introduction to mechanical vibration. Prereq. 02.305.

2.307 Mechanics Statics (4 cl., 4 q.h.)

Forces, moments, couples, statics of particles, and rigid bodies in three dimensions. Distributed forces — external and internal. First moments and centroids. Analysis of structures, second moments, and virtual work. Prereq. 0.320 and 11.317.

2.321 Stress Analysis I (2 cl., 2 q.h.)

Stress and deformation; mechanical properties of materials; allowable stresses and factor of safety; axially loaded indeterminate members; effects of temperature on stresses and strains; thin cylinders and spheres. Riveted and welded joints. Prereq. 02.303.

2.322 Stress Analysis II (2 cl., 2 q.h.)

Shear and bending moment in beams; stresses in beams; design of beams; curvature of beams. Prereq. 02.321.

2.323 Stress Analysis III (2 cl., 2 q.h.)

Determinate and indeterminate beam deflections and reactions by numerical and graphical integration and area moment methods; theorem of three moments. Prereq. 02.322.

2.324 Advanced Stress Analysis I (2 cl., 2 q.h.)

Torsional stresses and strains; power transmission; eccentric loads on struts, arms, riveted and welded joints; combined stresses, principal stresses, Mohr's circle; theories of failure. Prereq. 02.323.

2.325 Advanced Stress Analysis II (2 cl., 2 q.h.)

Riveted beams; non-symmetrical bending of beams; shear-center and shear stresses on thin sections; composite beams. Prereq. 02.324.

2.326 Advanced Stress Analysis III (2 cl., 2 q.h.)

Columns; energy absorption and resilience; dynamic loading; deflection of beams by energy methods. Bolted fastenings. Prereq. 02.324.

2.327 Mechanical Design I (2 cl., 2 q.h.)

Introduction and principles of design, properties and selection of materials; stress concentrations; strength under combined stresses; theories of failure; impact and fluctuating and repeated loads. Prereq. 02.306, 02.323.

02.328 Mechanical Design II (2 cl., 2 q.h.)

Stresses, deformation and design of fasteners, screws, joints, springs, and bearings. Lubrication and journal bearings. *Prereq.* 02.327.

02.329 Mechanical Design III (2 cl., 2 q.h.)

Stresses and power transmission of spur, bevel, and worm gear; shaft design clutches, and brakes. *Prereq.* 02.327.

02.331 Mechanical Technology Laboratory I (3 lab., 2 q.h.)

Experiments concerning the physical properties of materials. Instrumentation and measurement. *Prereq.* 02.343, 02.324 or concurrently.

02.332 Mechanical Technology Laboratory II (3 lab., 2 q.h.)

Experiments concerning compressible and incompressible fluids. Experimental techniques. *Prereq.* 02.331, 01.341.

02.333 Mechanical Technology Laboratory III (3 lab., 2 q.h.)

Experiments of a more advanced nature. Introduction to the analog computer and experimental stress analysis. *Prereq.* 02.332, 02.325.

02.334 Experimental Stress Analysis I (2 cl., 2 q.h.)

Theory and experimentation showing the application of extensometers and electrical strain gages as transducers and in the field of experimental stress and strain analysis. *Prereq.* 02.324.

02.335 Experimental Stress Analysis II (2 cl., 2 q.h.)

Theory and laboratory practice of photoelastic methods as applied to classical model analysis and modern coating analysis. *Prereq.* 02.334.

02.336 Experimental Stress Analysis III (2 cl., 2 q.h.)

The use of resinous and ceramic brittle coatings in experimental analysis; Moiré method of strain analysis; statistical treatment of experimental data. *Prereq.* 02.335.

02.337 Mechanical Vibrations I (2 cl., 2 q.h.)

Elements of vibrating systems, one degree of freedom (undamped free and forced vibration from Newton's law of motion and energy methods.) Natural frequencies. Damped free and forced vibration. Impedance and mobility. *Prereq.* 02.306.

02.338 Mechanical Vibrations II (2 cl., 2 q.h.)

Systems with more than one degree of freedom. Influence coefficients, Lagrange's equations, generalized coordinates, vibration absorber. *Prereq.* 02.337.

02.339 Mechanical Vibrations III (2 cl., 2 q.h.)

Natural frequencies by Rayleigh methods and Holzer methods for multi-degree of freedom. Application problems with combined rotation and translation. Laplace transforms and electro-mechanical analogs. *Prereq.* 02.338.

02.341 Materials I (2 cl., 2 q.h.)

Lectures on: fundamental material structures, general information covering theoretical aspects of properties, testing and failure of materials supplemented by visual aids. *Prereq.* none.

02.342 Materials II (2 cl., 2 q.h.)

Lectures on: alloying and hardening of metals, refinement of metals, equilibrium diagrams, characteristics of engineering materials, principles of material fabrication. *Prereq.* 02.341.

2.343 Materials III (2 cl., 2 q.h.)

lectures on: Inorganic materials, i.e., polymers, glasses, ceramics, cements, wood; and materials having important electrical and magnetic properties, also summary of the most up-to-date applications for the fabrication and uses of other metals and non-metals. *Prereq. 02.342.*

2.344 Applied Metallurgy I (1 cl., 1 lab., 2 q.h.)

lectures: Structures of metals, imperfections, phase diagrams, effect of temperature on structure and properties of metals (annealing, recrystallization, recovery, precipitation, diffusion); strengthening mechanisms, mechanical properties of non-ferrous metals.

aboratory: Experiments in preparation of samples, selection, polishing, and etching; examination of non-ferrous metals; use of the microscope; linear analysis; construction of cooling curves and simple binary phase diagrams. *Prereq. 02.342.*

2.345 Applied Metallurgy II (1 cl., 1 lab., 2 q.h.)

lectures: Mechanical properties of ferrous metals, the iron carbon diagram, high temperature alloys, hardening methods, impact tests, effects of environment on metals.

aboratory: Experiments on analysis of stress-strain diagrams of iron and steel, heat treatment of steels, surface corrosion, tempering and drawing, use of metallograph and analysis of the results. *Prereq. 02.344.*

2.346 Applied Metallurgy III (1 cl., 1 lab., 2 q.h.)

lectures: Manufacturing processes, methods of fabrication; limitations on the use of different materials and processes; casting, welding, cutting, drawing, powder metallurgy.

aboratory: Experiments in cold rolling, swaging, drawing of non-ferrous metals and the analysis of the results. Tension, shear, fatigue, and machinability tests of ferrous metals. *Prereq. 02.345.*

2.347 Principles of Aerodynamics (4 cl., 4 q.h.)

This is a first course in aerodynamics covering the fundamentals of theory and application. Material presented includes: properties of air, fluid flow principles, lift, drag; air foil and wing theory; Auxiliary lift devices; stability and control; and flight vehicle performance. *Prereq. 01.343.*

2.351 Thermodynamics I (2 cl., 2 q.h.)

General theory of heat and matter; laws of thermodynamics; energy-transformation principles; properties and processes for pure substances. Thermodynamic properties and processes of liquids and vapors; mollier diagram and tables. *Prereq. 11.318.*

2.352 Thermodynamics II (2 cl., 2 q.h.)

Properties and processes for ideal gases. Heat engines, carnot cycle, availability of energy. Tables and charts; vapor power cycles. *Prereq. 02.351.*

2.353 Thermodynamics III (2 cl., 2 q.h.)

Theory of vapor engines and analysis of types of actual engines using compression of gases and vapors; internal combustion engines. Theory of gas and vapor flow through orifices and nozzles. *Prereq. 02.352.*

02.354 Heat Transfer I (2 cl., 2 q.h.)

The primary modes of heat transfer; thermal conductance/resistance concept; thermal-electrical analogy; combined heat transfer mechanisms; basic equations of conduction; thermal conductivity; analytical solutions of various steady state conduction problems. *Prereq.* 02.353.

02.355 Heat Transfer II (2 cl., 2 q.h.)

Dimensional analysis and similarity considerations; natural and forced convection; hydrodynamic and thermal boundary layers; log-mean temperature differences; overall heat transfer coefficients; applications to heat exchangers. *Prereq.* 02.354.

02.356 Heat Transfer III (2 cl., 2 q.h.)

Black body radiation; Kirchoff's Law; emissivity and absorptivity; radiation between simple bodies. Graphical and numerical methods applied to steady state, conduction problems; radiation and convection effects; transient heat transfer; numerical methods applied to transient problems; heat transfer engineering problems. *Prereq.* 02.355.

02.357 Heat Engineering I (Refrigeration) (2 cl., 2 q.h.)

Principles of gas compression, analysis of vapor compression, refrigeration systems, low temperature refrigeration cycles, and absorption refrigeration systems. *Prereq.* 02.353.

02.358 Heat Engineering II (Air Conditioning) (2 cl., 2 q.h.)

Air conditioning principles including psychometrics and heat pumps. Calculation of heating and cooling loads in accordance with A.S.H.R.A.E. practices. *Prereq.* 02.353.

02.359 Heat Engineering III (Turbines) (2 cl., 2 q.h.)

Design and performance of steam and gas turbines; spark-ignition and compression-ignition engine design and performance, fan performance. *Prereq.* 02.353.

02.361 Heat Technology Laboratory I (3 lab., 2 q.h.)

Experiments illustrating principles thermodynamics and heat transfer. Instrumentation and measurement. *Prereq.* 02.353.

02.362 Heat Technology Laboratory II (3 lab., 2 q.h.)

Experiments on various types of heat engines. Experimental techniques. *Prereq.* 02.361, 02.354 and 02.357.

02.363 Heat Technology Laboratory III (3 lab., 2 q.h.)

Experiments of a more advanced nature further illustrating the principles of thermodynamics and making use of the student's increased theoretical background. Simulation of heat problems on analog computer. *Prereq.* 02.362.

02.401 Man and Materials (2 cl., 2 q.h.)

(See General Interest Courses pages 152-153)

02.411 Mechanics A (4 cl., 4 q.h.)

(Day Curriculum)

Forces, moments, couples, statics of particles and rigid bodies in two and three dimensions. Distributed forces — external and internal. First moments and centroids. Analysis of structures — trusses, frames, and machines. *Prereq.* 10.320, 11.317.

- .412 Mechanics B** (4 cl., 4 q.h.) (Day Curriculum)
 motion, second moments, and virtual work. Kinematics of particles — rectilinear and curvilinear motion of dynamic particles — force, mass and acceleration, work and energy. *Prereq.* 02.411.
- .413 Mechanics C** (4 cl., 4 q.h.) (Day Curriculum)
 impulse and momentum of particles. Kinematics and dynamics of rigid bodies — force, mass, and acceleration. Dynamics of rigid bodies — work and energy, pulse and momentum. Introduction to mechanical vibration. *Prereq.* .412.
- .414 Stress Analysis A** (4 cl., 4 q.h.) (Day Curriculum)
 stress and deformation; mechanical properties of materials; allowable stresses and factor of safety; axially loaded indeterminate members; effects of temperature on stresses and strains; thin cylinders and spheres. Riveted and welded joints. Shear and bending moment in beams; stresses in beams; design of arms; curvature of beams. *Prereq.* 02.411.
- .415 Stress Analysis B** (3 cl., 4 q.h.) (Day Curriculum)
 determinate and indeterminate beam deflections and reactions by numerical and graphical integration and area moment methods; theorem of three moments. Torsional stresses and strains; power transmission; eccentric loads on shafts, beams, riveted and welded joints; combined stresses, principal stresses, Mohr's circle; theories of failure. *Prereq.* 02.414.
- .416 Stress Analysis C** (4 cl., 4 q.h.) (Day Curriculum)
 riveted beams; non-symmetrical bending of beams; short-center and shear stresses on thin sections; composite beams. Columns; energy absorption and resilience; inertial stresses impact loading; deflection of beams by energy methods. Bolted fastenings. *Prereq.* 02.415.
- .417 Mechanical Design A** (4 cl., 4 q.h.) (Day Curriculum)
 failure criteria; properties and selection of materials; manufacturing considerations; stress concentrations; strength under combined stresses; theories of failure; impact; and fluctuating and repeated loads. Stresses, deformation and sign of springs; screws, keys, pins, and interference fits; preloading of bolted joints; shafts and flywheels, friction brakes. *Prereq.* 02.415.
- .418 Mechanical Design B** (2 cl., 2 q.h.) (Day Curriculum)
 fabrication and journal bearings; anti-friction bearings; stresses and power transmission of spur, bevel, and worm gear; screws for power transmission. *Prereq.* 02.417.
- .421 Thermodynamics A** (4 cl., 4 q.h.) (Day Curriculum)
 general theory of heat and matter; laws of thermodynamics; energy-transformation principles and availability of energy; properties and processes for pure substances and ideal gases. Thermodynamic properties and processes of liquids and vapors; tables and charts; mixtures of fluids; vapor cycles. *Prereq.* .318.
- .422 Thermodynamics B** (4 cl., 4 q.h.) (Day Curriculum)
 theory of vapor engines and analysis of types of actual engines using compression of gases and vapors; internal combustion engines. Theory of gas and vapor flow through orifices and nozzles. Design and performance of steam and gas turbines; spark-ignition and compression-ignition engine design and performance. Fan performance. *Prereq.* 02.421.

02.423 Thermodynamics C (4 cl., 4 q.h.)

(Day Curriculum)

Air conditioning principles including psychometrics and heat pumps. Calculation of heating and cooling loads in accordance with A.S.H.R.A.E. practice Principles of gas compression, analysis of vapor compression, refrigeration systems, low temperature refrigeration cycles and absorption refrigeration systems. *Prereq. 02.422.*

02.424 Thermodynamics D (2 cl., 2 q.h.)

(Day Curriculum)

The primary modes of heat transfer; thermal conductance/resistance concept; thermal-electrical analog; combined heat transfer mechanisms; basic equation of conduction; thermal conductivity; analytical solutions of various steady state conduction problems. *Prereq. 02.422.*

02.425 Thermodynamics E (4 cl., 4 q.h.)

(Day Curriculum)

Dimensional analysis and similarity considerations; natural and forced convection; hydrodynamic and thermal boundary layers; log-mean temperature differences; overall heat transfer coefficients; applications to heat exchangers; Black body radiation; Kirchoff's Law; emissivity and absorptivity; radiation between simple bodies. Graphical and numerical methods applied to steady state conduction problems; radiation and convection effects; transient heat transfer numerical methods applied to transient problems; heat transfer engineering problems. *Prereq. 02.424.*

02.431 Materials A (4 cl., 4 q.h.)

(Day Curriculum)

Lectures on: fundamental metallic structures, general metallurgical information covering theoretical aspects of properties, testing and failure of metals. Supplemented by visual aids. Lectures on: alloying and hardening of metals, refinement of metals, equilibrium diagrams, characteristics of engineering metals, principles of metal fabrication. *Prereq. none.*

02.432 Materials B (4 cl., 4 q.h.)

(Day Curriculum)

Lectures on: Inorganic materials, i.e., polymers, glasses, ceramics, cements, wood; and materials having important electrical and magnetic properties, also a summary of the most up-to-date applications for the fabrication and uses of both metals and non-metals. Structures of metals, imperfections, phase diagrams, effect of temperature on structure and properties of metals, (annealing, recrystallization, recovery, precipitation, diffusion); strengthening mechanisms, mechanical properties of non-ferrous metals.

Laboratory: Experiments in preparation of samples, selection, polishing, and etching, examination of non-ferrous metals, use of the microscope, linear analysis, construction of cooling curves, and simple binary phase diagrams. *Prereq. 02.431.*

02.433 Applied Metallurgy (4 cl., 4 q.h.)

(Day Curriculum)

Lectures: Mechanical properties of ferrous metals, the iron carbon diagram, high temperature alloys, hardening methods, impact tests, effects of environment on metals. Manufacturing processes, methods of fabrication; limitations on the use of different materials and processes; casting, welding, cutting, drawing, powder metallurgy.

Laboratory: Experiments on analysis of stress-strain diagrams of iron and steel, heat treatment of steels, surface corrosion, tempering and drawing, use of metallograph and analysis of the results. Experiments in cold rolling, swaging, drawing of non-ferrous metals and the analysis of the results. Tension, shear, fatigue, and machinability tests on ferrous metals. *Prereg. 02.432.*

- .441 Fluid Mechanics A** (4 cl., 4 q.h.) (Day Curriculum)
Hydrostatics, principles governing fluids at rest; pressure measurement; hydrostatic forces on submerged areas and objects; simple dams; fluids in moving vessels; hoop tension. Fluid flow in pipes under pressure; fluid energy, power and friction loss; Bernoulli's Theorem; flow measurement. Prereq. 02.412.
- .442 Fluid Mechanics B** (2 cl., 2 q.h.) (Day Curriculum)
Flow networks and reservoir systems; flow in open channels; uniform flow; energy, friction loss, minor losses, velocity distribution, alternate stages of flow, critical flow; non-uniform flow; accelerated and retarded flow; hydraulic jump and waves. Prereq. 02.441.
- .451 Mechanical Vibrations** (4 cl., 4 q.h.) (Day Curriculum)
Elements of vibrating systems, one degree of freedom (undamped free and forced vibration from Newton's law of motion and energy methods.) Natural frequencies. Damped free and forced vibration. Impedance and mobility. Systems with more than one degree of freedom. Influence coefficients, Lagrange's equations, generalized coordinates, vibration absorber. Prereq. 02.413.
- .452 Experimental Stress Analysis** (4 cl., 4 q.h.) (Day Curriculum)
Theory and experimentation showing the application of extensometers and electrical strain gages as transducers in the field of experimental stress and strain analysis. Theory and laboratory practice photoelastic methods as applied to classical model analysis and modern coating analysis. Prereq. 02.415.
- .461 Machine Shop** (2 cl., 3 lab. — 4 q.h.) (Day Curriculum)
Introduction to study of machines for metal processing, cutting tools, and aids. Machinability; automatic machinery. Prereq. none.
- .462 Mechanical Technology Laboratory I** (3 lab., 2 q.h.) (Day Curriculum)
Experiments concerning the physical properties of materials. Instrumentation and measurement. Prereq. 02.431, 02.415, or concurrently.
- .463 Mechanical Technology Laboratory II** (3 lab., 2 q.h.) (Day Curriculum)
Experiments concerning compressible and incompressible fluids. Experimental techniques. Prereq. 02.462, 02.441.
- .464 Mechanical Technology Laboratory III** (3 lab., 2 q.h.) (Day Curriculum)
Experiments of a more advanced nature. Introduction to the analog computer and experimental stress analysis. Prereq. 02.463.
- .465 Heat Technology Laboratory I** (3 lab., 2 q.h.) (Day Curriculum)
Experiments illustrating principles of thermodynamics and heat transfer. Instrumentation and measurement. Prereq. 02.422 or concurrently.
- .466 Heat Technology Laboratory II** (3 lab., 2 q.h.) (Day Curriculum)
Experiments on various types of heat engines. Experimental techniques Prereq. .465; 02.424, or concurrently.
- .467 Project Lab.** (6 cl., 4 q.h.) (Day Curriculum)
Project of analytical, design, or experimental nature. Must be approved by student's faculty adviser. A formal report must be submitted. Prereq. 02.464; .466.

ELECTRICAL ENGINEERING TECHNOLOGY

03.301 Circuit Theory I (2 cl., 2 q.h.)

Ohm's law, Kirchoff's current and voltage laws, equivalent resistances and sources, mesh and nodal analysis, network theorems, and power relations all with respect to direct currents. *Prereq. 10.320 and 11.319.*

03.302 Circuit Theory II (2 cl., 2 q.h.)

Energy storage, singularity functions, response of R, L and C elements to singularities. *Prereq. 03.301, 10.322 Concurrently.*

03.303 Circuit Theory III (2 cl., 2 q.h.)

Complex algebra, phasors, frequency domain, mutual inductance, transformers steady-state a-c theory, driving point and transfer impedances, power and energy in a-c circuits. *Prereq. 03.302.*

03.304 Circuit Theory IV (2 cl., 2 q.h.)

Laplace transforms; partial fraction expansion; Laplace transform techniques applied to the solution of RLC networks. *Prereq. 03.303.*

03.305 Circuit Theory V (2 cl., 2 q.h.)

Consideration of balanced and unbalanced polyphase power circuits; symmetrical components, harmonic analysis. *Prereq. 03.304.*

03.306 Electrical Measurements (2 cl., 2 q.h.)

Measurement of voltage, current, power, resistance, capacitance, inductance, impedance, frequency, etc. Direct and substitution measurements. Evaluation of measured data — standard deviation and tolerance limits, instruments calibrations — effects of residual impedance. *Prereq. 03.304, 10.323.*

03.311 Electronics I (4 cl., 4 q.h.)

Semiconductor diodes, power supplies and filters. Transistors as amplifying devices. Graphical analysis of basic amplifiers, d-c and a-c load lines. Transistor biasing techniques. *Prereq. 03.303, 11.323 or 11.320.*

03.312 Electronics II (4 cl., 4 q.h.)

Small signal low frequency transistor models. A-c equivalent circuits, low frequency amplifier circuits. Frequency effects in audio amplifiers. High frequency transistor model. Voltage regulation. *Prereq. 03.311.*

03.313 Electronics III (4 cl., 4 q.h.)

Continuation of transistor circuits. Untuned amplifiers, feedback amplifiers, low frequency large signal amplifiers. Field effect transistor circuits, and operational amplifiers. *Prereq. 03.312.*

03.314 Pulse and Digital Circuits I (2 cl., 2 q.h.)

Study of wave shaping circuitry including clippers, clampers, slicers, rise time, and sag. Review of semiconductor diodes. Study of the use of the transistor as a switch. Emphasis is placed on the non-linear aspects of transistors including transient switching characteristics. Review of semi-conductor diodes. RL networks, introduction to pulse transformers, delay lines and pulse forming networks. *Prereq. 03.313.*

315 Pulse and Digital Circuits II (2 cl., 2 q.h.)

merging systems; binary notation, and Boolean Algebra. Analysis of integrated OR, AND, NOT, NAND, and NOR circuits including characteristics of various logic families. Study of details of shift register and diode matrix. *Prereq. 314.*

316 Pulse and Digital Circuits III (2 cl., 2 q.h.)

Vibrator circuits; bistable, astable, and monostable. Study of counting and timing circuits. Synchronization, voltage and current time-based generators. Analysis of Schmitt trigger and differential comparator circuits. *Prereq. 03.315.*

317 Principles of Communication Systems I (4 cl., 4 q.h.)

ysis of RLC tuned circuits including inductively coupled circuits. A study of class-C tuned power amplifiers. Analysis of RC, LC and quartz crystal oscillators. *Prereq. 03.313.*

318 Principles of Communication Systems II (4 cl., 4 q.h.)

roduction to noise and noise-figure. Discussion of Fourier analysis. Basic theory of amplitude, frequency, and phase-modulated systems is presented. Basic concepts of transmitter and receiver circuits are detailed. Comparison of noise susceptibility of the various systems is examined. *Prereq. 03.317.*

319 Principles of Communication Systems III (4 cl., 4 q.h.)

roduction to pulse communication systems. Basic discussion of sampling systems quantizers, encoders, modulators, transmission paths. Presentation of channel capacity and decoding systems. Error detection systems are compared. *Prereq. 03.318.*

320 Electricity and Electronics I (2 cl., 2 q.h.) (not for electrical majors)
roduction to circuit analysis, resistive networks, periodic excitation function, steady-state a-c circuits. *Prereq. 11.319.***321 Electricity and Electronics II** (2 cl., 2 q.h.)

Physical foundation of electronics, physical operation of electronic devices, single-stage electronic circuits. *Prereq. 03.320.*

322 Electricity and Electronics III (2 cl., 2 q.h.)

Magnetic circuits and transformers, electron-mechanical energy conversion; d-c machines, a-c machines. *Prereq. 03.321.*

323 Electronic Laboratory (3 lab., 2 q.h.)

Experiments dealing with laboratory equipment (meters and oscilloscopes) techniques, junction and field effect transistor characteristics, vacuum and semiconductor diodes, power supplies including the regulated type, silicon controlled rectifiers, resistance-coupled amplifiers using transistors, including feedback methods. *Prereq. 03.312.*

324 Circuits Laboratory I (3 lab., 2 q.h.)

Experimentation in electronic circuit theory utilizing various measurement techniques. Instrumentation verification of circuit theorems; response of circuits to steps and impulses; oscilloscope theory and applications. *Prereq. 03.306.*

325 Circuits Laboratory II (3 lab., 2 q.h.)

Further experimentation in electrical circuits and measurement techniques. Experiments include non-linear devices, terminal characteristics of active devices, log modulus plots, network parameters and synthesis, Fourier analysis and synthesis. *Prereq. 03.324.*

03.327 Advanced Electronic Laboratory I (3 lab., 2 q.h.)

Experiments dealing with oscilloscopes, class B audio amplifier with transistor push-pull amplifiers, drivers, and distortion measurements. Double-tuned transformers, video amplifiers, audio frequency oscillators, and square-wave testing of audio amplifiers and the study of operational amplifiers. Prereq. 03.320 03.313.

03.328 Advanced Electronic Laboratory II (3 lab., 2 q.h.)

Experiments dealing with modulation of a class C amplifier, the diode detector, basic timing circuits, RF and crystal oscillators, networks in FM and television equipment, pulse and counter circuits and frequency dividers, sawtooth generators, astable (free-running) multivibrators, logic gates, frequency modulation detectors. Prereq. 03.327.

03.329 Advanced Electronic Laboratory III (3 lab., 2 q.h.)

Spectral studies of FM and PM waves, amplitude limiters. The balance modulators and single sideband generators. Binary adders, registers and counter testing of a radio receiver, television receiver demonstration, analog computers. Pulse forming and delay lines, slotted lines, a series of five microwave experiments, and a series of four digital experiments. Prereq. 03.328.

03.331 Energy Conversion I (2 cl., 2 q.h.)

Generalized theory of electromechanical energy conversion. Two-winding transformer; general torque form applied to singly and doubly-excited rotating devices. Prereq. 03.303 and 10.323.

03.332 Energy Conversion II (2 cl., 2 q.h.)

Induction and synchronous machines. Equivalent circuit models, steady-state operating modes, applications. Prereq. 03.331.

03.333 Energy Conversion III (2 cl., 2 q.h.)

D-c machine; transfer functions and flow chart analysis. Laplace transform techniques applied to the analysis of dynamic operating modes of rotating machines. Prereq. 03.332.

03.334 Control Circuits (2 cl., 2 q.h.)*

Basic control design considerations; circuit transfer functions, time and frequency response relationships, bode diagrams. General feedback applications stability and compensating techniques as related to more complex control systems. Prereq. 03.333.

03.335 Control Circuits II (2 cl., 2 q.h.)

Characteristics and construction of common control circuit devices; synchros, choppers, magnetic amplifiers, SCR's, control motors, gear trains, tachometers. Prereq. 03.334.

03.336 Control Circuits III (2 cl., 2 q.h.)

System open and closed loop transfer functions; stability, speed of response and accuracy trade-offs. Industrial uses including speed and voltage regulation, photoelectric, timing, sorting, and temperature control applications. Prereq. 03.335.

*03.334, 335, 336 Control Circuits I, II, III not to be offered during the 1974-75 year.

.337 Basic Power Systems I (4 cl., 4 q.h.)

Consideration of power transmission lines; line constants; current, voltage, and power relations; introduction to electric-power distribution loads, feeders, and substations; application of matrices. *Prereq.* 03.333.

.338 Basic Power Systems II (4 cl., 4 q.h.)

Consideration of symmetrical and unsymmetrical faults; protective devices — application and coordination; power flow in electric circuits; steady-state operations of systems; voltage regulation theory and application. *Prereq.* 03.337.

.339 Basic Power Systems III (4 cl., 4 q.h.)

Computer applications to power systems with emphasis on load-flow studies; basic ideas of system planning, short-circuit studies and system stability. *Prereq.* 03.338.

.341 Power and Controls Laboratory I (4 lab., 2 q.h.)*

Experimentation on measurement techniques, basic devices and circuits (including power circuits), transformers. *Prereq.* 03.333 and 03.334 or concurrently.

.342 Power and Controls Laboratory II (4 lab., 2 q.h.)

Experimentation on the steady-state and dynamic characteristics of rotating machines. *Prereq.* 03.341.

.343 Power and Controls Laboratory III (4 lab., 2 q.h.)

Experimentation on control devices, systems including transient and steady-state responses, voltage and speed control systems, polyphase power rectifiers. *Prereq.* 03.342.

.344 Fundamental Electricity and Residential Power Circuits (2 cl., 2 q.h.)

Fundamentals of electrical work, terminology, basic principles and the theory behind general practice in accordance with the National Electric Code presented with an analysis of the actual wiring of residential buildings and homes. Wiring analysis of non-residential buildings such as churches, schools, stores, etc. for below 600 volts service is also included. *Prereq.* 10.329, 306.

.345 Industrial Power Circuits (2 cl., 2 q.h.)

Survey of the use of sound engineering principles in the design of electric distribution systems which are applicable to most types and sizes of industrial units. *Prereq.* 03.344.

.346 Electronics for Industry I (2 cl., 2 q.h.)

Two-terminal devices. Diode rectifiers and filters. Transistors and vacuum tubes. D. C. biasing. *Prereq.* 03.302.

.347 Electronics for Industry II (2 cl., 2 q.h.)

Small signal analysis. Field effect transistors. Multi-stage systems. Decibel and frequency considerations. Large signal amplifiers. *Prereq.* 03.346.

03.348 Electronics for Industry III (2 cl., 2 q.h.)

PNPN and other Devices. Differential and operational amplifiers. Regulator and miscellaneous circuit applications. Cathode ray oscilloscope. *Prereq. 03.347.*

***03.351 Bioelectronic Devices I** (2 cl., 2 q.h.)

Transducers, relating body functions and biomedical reactions to electronic signals. Optics and optical components including mirror lenses, prisms, an gratings. Defraction and refraction of light into spectral components an spectra. *Prereq. 03.312.*

***03.352 Bioelectronic Devices II** (2 cl., 2 q.h.)

Operational amplifier design and utilization, special power supply design Chromatography and design of chromatography systems. Spectrophotometr radiation counting equipment and Ph measurement equipment related t chromatography. The electrocardiograph, electroencephalograph, and relate physiological equipment will be discussed. *Prereq. 03.351.*

***03.353 Bioelectronic Devices III** (2 cl., 2 q.h.)

Blood pressure and flow measurement including ultrasonic devices, centrifugation, and ultracentrifugation equipment as well as amino acid analyzers. Nerve conduction apparatus and techniques. Professional specialists in the field wi lecture on special topics. *Prereq. 03.352.*

***03.357 Bioelectronic Laboratory I** (3 lab., 2 q.h.)

Experiments dealing with oscilloscopes, transistor amplifiers with negativ feedback, directly coupled and difference amplifiers, clamping circuits, tran sients, logic circuits. Experiments in electronic circuitry including audio am plifiers, oscillators, and related circuits. *Prereq. 03.312.*

***03.358 Bioelectronic Laboratory II** (3 lab., 2 q.h.)

Experiments in optics covering lenses, mirrors, prisms, gratings, and spectra Radiation experiments. Special design experiments on the optical bench re lated to spectrophotometry, experiments with optical and electropical system Design of detection and amplification, monitoring systems. *Prereq. 03.357.*

***03.359 Bioelectronic Laboratory III** (3 lab., 2 q.h.)

Experiments and open discussion centered around bioelectronic systems includ ing electrocardiogram, electroencephalograph, amino acid analyzers, Ph meas urement and titration apparatus, centrifuges, and ultracentrifuges as well a radioactive sample changers. *Prereq. 03.358.*

03.360 Introduction to Radar Systems (4 cl., 4 q.h.)

Discussion of radar range equation, examination of CW, FM, MTI, Pulse-Dopple and monopulse systems. Description of transmitter, antennas, and receiver and a discussion of information extraction from typical radar waveforms *Prereq. 03.316 and 03.319.*

* Bioelectronic Devices (03.351, 03.352, 03.353) and the laboratory sequence (03.357, 03.358, 03.359) are offered every other year.

3.361. Transients in Linear Systems I (2 cl., 2 q.h.)

Application of differential equations to the solutions of linear, time-invariant electrical networks. Introduction to singularity functions, convolution, and time domain transient analysis. Prereq. 10.324 or concurrently, 03.304 or equivalent.

3.362 Transients in Linear Systems II (2 cl., 2 q.h.)

Network topology and duality, introduction to the methods of transformation calculus and complex frequency concepts. Signal analysis in the frequency domain. Fourier series, Fourier and Laplace transform methods. Prereq. 10.325 concurrently, 03.361.

3.363 Transients in Linear Systems III (2 cl., 2 q.h.)

A varied selection of circuit problems are solved using Laplace transforms, and related theorems. Prereq. 03.362.

3.364 Advanced Circuit Theory I (2 cl., 2 q.h.)

Definitions and tests are lumped, linear, time-invariant systems, review of matrix algebra. General analysis of networks by loop current and node voltage variables using matrix techniques. Prereq. 03.363.

3.365 Advanced Circuit Theory II (2 cl., 2 q.h.)

Study of two-port networks using various parameter systems. S-plane analysis of system response. General filter analysis. Prereq. 03.364.

3.366 Advanced Circuit Theory III (2 cl., 2 q.h.)

Discussion of the necessary and sufficient conditions for the physical realization of impedance functions; Forster and Cauer forms. Synthesis of filters. Prereq. 03.365.

3.367 Advanced Pulse and Digital Circuits I (2 cl., 2 q.h.)

Linear and non-linear pulse forming and processing techniques. Design of logic and binary circuits for operation under severe environmental conditions. Prereq. 03.363.

3.368 Advanced Pulse and Digital Circuits II (2 cl., 2 q.h.)

Analysis of applications of existing integrated circuits. Prereq. 03.367.

3.369 Advanced Pulse and Digital Circuits III (2 cl., 2 q.h.)

Negative-impedance devices and their applications. Linear voltage and current feedback circuits. Prereq. 03.368.

3.371. Analog, Digital and Hybrid Computers I (2 cl., 2 q.h.)

Theory and operation of analog computers. Amplitude scaling and time scaling of the analog computer and application of the analog computer to the solution of linear and non-linear differential equations. Prereq. 10.325.

3.372 Analog, Digital and Hybrid Computers II (2 cl., 2 q.h.)

Introduction to the field of digital computer design. Topics include general computer organization, number systems and number representations, characteristics of major computer units. Boolean Algebra application to computer design. Prereq. 03.371.

3.373 Analog, Digital and Hybrid Computers III (2 cl., 2 q.h.)

Survey of the present state-of-the-art hybrid computers. Problem areas unique to hybrid computers such as interface, analog-to-digital and digital-to-analog conversion will also be discussed. Hybrid computer programming techniques. Direct digital process control computers. Prereq. 03.372.

03.374 Digital Systems I (2 cl., 2 q.h.)

Basic concepts of Boolean Algebra. Switching components. Review of number systems, codes, and negative number representation. Analysis and synthesis of combinational circuits. Examples of application. *Prereq.* 03.316.

03.375 Digital Systems II (2 cl., 2 q.h.)

Data acquisition techniques. Analysis and synthesis of sequential circuits. Examples of applications. Analog and digital data reduction. Real time data processing. *Prereq.* 03.374.

03.376 Digital Systems III (2 cl., 2 q.h.)

Residue number systems. Threshold logic concepts. Advanced digital system techniques with application to complex systems. Data decommutation techniques relative to communications systems. Aerospace telemetry systems. *Prereq.* 03.375.

03.377 Control Systems I (2 cl., 2 q.h.)

Analysis of linear servomechanisms under both transient and steady-state conditions. Signal flow graphs. *Prereq.* 03.363.

03.378 Control Systems II (2 cl., 2 q.h.)

Laplace transforms used in the formulation of block diagrams and transfer functions. System stability. Root locus techniques. *Prereq.* 03.377.

03.379 Control Systems III (2 cl., 2 q.h.)

Treatment of Nyquist criteria, and Bode diagram methods for systems evaluation. *Prereq.* 03.378.

03.381 Linear Active Circuit Design I (2 cl., 2 q.h.)

Review of large and small signal analysis for bipolar, unipolar, and integrated circuit devices. Review of feedback principles as applied to discrete, hybrid and integrated circuit amplifiers or regulators. Signal flow graph analysis will be used to determine accuracy and sensitivity of feedback loops. *Prereq.* 03.313.

03.382 Linear Active Circuit Design II (2 cl., 2 q.h.)

Factors influencing high and low frequency response, and slew rate of both discrete and integrated circuit amplifiers. Bode and gain-phase plots will be used to analyze stability of feedback loops. *Prereq.* 03.381.

03.383 Linear Active Circuit Design III (2 cl., 2 q.h.)

Active filter and oscillator design using both discrete and hybrid/integrated circuits. Principles of low-noise video amplifiers. Design of linear integrated electronic systems. *Prereq.* 03.382.

03.384 Microwave Semiconductor Devices and Circuits I (2 cl., 2 q.h.)

Provides basic understanding of the principles and design techniques for microwave circuits utilizing semiconductor devices. Introduction to microwave theory and techniques. Development of the Smith Chart for the graphical solution of microwave problems. *Prereq.* 03.304.

03.385 Microwave Semiconductor Devices and Circuits II (2 cl., 2 q.h.)

Introduction to the basic properties of semiconductors at microwave frequencies including analysis of bulk semiconductor effects and of junction phenomena. The course will analyze the physical properties and microwave characteristics of avalanche diodes, varactor diodes, tunnel diodes, PIN diodes, Gunn effect devices, and the microwave transistors. *Prereq.* 03.384.

3.386 Microwave Semiconductor Devices and Circuits III (2 cl., 2 q.h.)
 design and utilization of semiconductor devices in microwave circuits for microwave generation, amplification, frequency conversion, multiplication, and detection. Introduction to the miniaturization of microwave circuits and the integration of microwave functions. The characteristics and limitations of the devices. Prereq. 03.385.

3.387 Integrated Circuits I (2 cl., 2 q.h.)
 near integrated circuits, operational amplifiers-characteristics, selection criteria, linear and nonlinear circuit applications, D/A and A/D converters. Prereq. 3.313.

3.388 Integrated Circuits II (2 cl., 2 q.h.)
 gital building blocks, truth tables and synthesis of digital logic. Flip-flops and ring circuits, logic families and specifications, arithmetic operations. Prereq. 3.387.

3.389 Integrated Circuits III (2 cl., 2 q.h.)
 ithmetic operations concluded, counters, registers and decoding, memories-magnetic, TTL and MOS, theory applied to calculators, digital phase lock loops. Prereq. 03.388.

3.391 Computer Technology Laboratory II (3 lab., 2 q.h.)
 gic performing circuits, flip-flops, binary-counters, sampling gates, pulse d counter circuits and frequency dividers, a study of an analog computer. Prereq. 03.327 or 09.356.

3.392 Computer Technology Laboratory III (3 lab., 2 q.h.)
 continuation of 03.391 topics plus the use of a PDP 8I minicomputer. Prereq. .391.

.394 Electrical — Electronic Principles A (3 cl., 3 q.h.)
 ws of voltage, current, and power. Series and parallel circuits. Principles of magnetism, and electro-magnetic induction. Alternating current, voltage, and power relationships. Principles of capacitive and inductive reactance. Series parallel a-c circuits including resonance. Transformer, motor, and generator principles. Meters. Prereq. 10.503, 11.306.

.395 Electrical — Electronic Principles B (3 cl., 3 q.h.)
 cum tubes, semiconductor diodes, and transistors. Principles of filters. Power supplies, amplifiers, oscillators, pulse circuits, motor and generator principles and applications. Prereq. 03.307.

.396 Basic Optics for Instrumentation (2 cl., 2 q.h.)
 ovides the necessary background for the two instrumentation courses listed below. Includes basic topics in geometrical and physical optics. No previous background in optics is assumed. Topics included are: Gaussian optics; fundamental laws of image formation; basic elements of optical design; scalar wave theory; interference and diffraction; polarization; basics of coherent (laser) and non-coherent optics. Prereq. 10.308.

.397 Optical Instrumentation I (2 cl., 2 q.h.)
 eat the classical image forming instruments (telescopes, microscopes, etc.) components of optical systems. Includes magnification; aberrations; resolution criteria; photometry; compatibility of system components and optimization of systems. Topics in coherent imaging such as phase contrast and holography. Prereq. 03.396.

03.398 Optical Instrumentation II (2 cl., 2 q.h.)

The basic non-image forming systems used for analysis control and metrology. Includes: spectroscopy, interferometry (classical and holographic), electron optical, and X-Ray systems. *Prereq.* 03.397.

03.399 Fundamentals of Operational Amplifiers (2 cl., 2 q.h.)

Emphasis on treating the amplifier as a black box. Covers gain, distortion, feedback, matching, offset, drift, and frequency response. A section on practical applications. *Prereq.* 03.312.

03.401 Electric Devices and Systems I (2 cl., 2 q.h.)

(See General Interest Courses, pages 152-153)

03.402 Electric Devices and Systems II (2 cl., 4 q.h.)

(See General Interest Courses, pages 152-153)

03.410 Electrical Measurements (4 cl., 4 q.h.)

(Day Curriculum)

Measurement of voltage, current, power, resistance, capacitance, inductance, impedance, frequency, etc. Direct and substitution measurements. Evaluation of measured data — standard deviation and tolerance limits, instruments calibrations — effects of residual impedance. *Prereq.* 03.454.

03.420 Electricity and Electronics I (4 cl., 4 q.h.)

(Day Curriculum)

Introduction to circuit analysis, resistive networks, periodic excitation functions, steady state a-c circuits. The physical foundations of electronics and the physical operation of electronic devices. *Prereq.* 11.319.

03.421 Electricity and Electronics II (4 cl., 4 q.h.)

(Day Curriculum)

Single-stage electronic circuits, magnetic circuits and transformers, electro-mechanical energy conversion, d-c machines, a-c machines. *Prereq.* 03.420.

03.440 Physical Electronics (4 cl., 4 q.h.)

(Day Curriculum)

Electron Ballistics and applications. Properties of atoms and electrons as related to conduction of electricity in solids. Fundamentals of semiconductors, crystal diodes, and transistors. Theory of field-effect transistors, integrated circuits, and photoelectric devices. *Prereq.* 11.420.

03.430 Energy Conversion (4 cl., 4 q.h.)

(Day Curriculum)

Generalized theory of rotating energy conversion devices. Steady-state operation of the multiply-excited direct-current machine. Control of speed; servomachines. Transformers, steady-state considerations of induction and synchronous machines. Generalized machine and circuit model. Laplace transform techniques applied to the analysis of dynamic operating modes of rotating machines. *Prereq.* 03.452 and 10.422.

03.437 Distributed Systems (4 cl., 4 q.h.)

(Day Curriculum)

Radiation, transmission, and reception of electromagnetic waves. Distributed-line constants and traveling waves of transmission lines. Differential equations of the uniform line. *Prereq.* 10.422.

03.451 Circuit Analysis I (4 cl., 4 q.h.)

(Day Curriculum)

Ohm's law, Kirchoff's current and voltage laws, equivalent resistances and sources, mesh and nodal analysis, network theorems, two-port networks and power relations — all with respect to direct currents. Energy storage, singularity functions, response of R, L, and C elements to singularities. *Prereq.* 10.320, 11.319.

- 3.452 Circuit Analysis II** (4 cl., 4 q.h.) (Day Curriculum)
 complex algebra, phasors, frequency domain, mutual inductance, transformers, steady-state a-c theory, driving point and transfer impedances, power and energy in a-c circuits. Laplace transforms; partial fraction expansion; Laplace transform techniques applied to the solution of RLC networks. Prereq. 03.451.
- 3.453 Circuits Analysis III** (4 cl., 4 q.h.) (Day Curriculum)
 application of differential equations to the solutions of linear, time-invariant electrical networks. Introduction to singularity functions, convolution, and time domain transient analysis. Network topology and duality, introduction to the methods of transformation calculus and complex frequency concepts. Prereq. 3.542.
- 3.454 Circuits Analysis IV** (4 cl., 4 q.h.) (Day Curriculum)
 signal analysis in the frequency domain. Fourier series. Fourier and Laplace transform methods. A varied selection of circuit problems are solved using Laplace transforms and related theorems. Prereq. 03.453.
- 3.460 Engineering Analysis I** (4 cl., 4 q.h.) (Day Curriculum)
 linear algebra and its application to circuit equations. Solution of linear differential equations including an introduction to Laplace transforms. Prereq. 0.422 and 03.452.
- 3.461 Engineering Analysis II** (4 cl., 4 q.h.) (Day Curriculum)
 complex variables and their relevance to an electrical engineering program. Prereq. 10.422.
- 3.470 Digital Computers** (4 cl., 4 a.h.) (Day Curriculum)
 introduction to the field of digital computer design. Topics include general computer organization, number systems and number representations, design characteristics of major computer units, Boolean Algebra applications to computer design. Prereq. 03.313 or concurrently.
- 3.477 Control Engineering I** (4 cl., 4 q.h.) (Day Curriculum)
 analysis of linear servomechanisms under both transient and steady-state conditions. Signal flow graphs. Laplace transforms used in the formulation of block diagrams and transfer function. Prereq. 03.454 and 10.422.
- 3.478 Control Engineering II** (4 cl., 4 q.h.) (Day Curriculum)
 system stability. Root locus techniques. Treatment of Nyquist criteria, and pole diagram methods for systems evaluation. Prereq. 03.477.
- 3.490 Optical Instrumentation** (4 cl., 4 q.h.) (Day Curriculum)
 telescopes, microscopes, etc. as optical system components. Includes magnification; aberrations; resolution criteria; photometry. Compatibility of system components and optimization of systems. The basic non-image forming systems used for analysis control and metrology. Prereq. 10.308 and 11.319.

CHEMICAL ENGINEERING TECHNOLOGY

- 4.381 Nuclear Technology I** (2 cl., 2 q.h.)
 atomic and nuclear structure, discovery and nature of radioactivity. Nuclear instrumentation for particle detection, monitoring, and experimentation. Supplementary laboratory experiments. Prereq. 10.323 and 11.319.

04.382 Nuclear Technology II (2 cl., 2 q.h.)

Nuclear reactions and energy; induced nuclear transformations; neutron properties. Radiological safety — the hazards, problems, and protection. Applications of radionuclides. Supplementary laboratory experiments. *Prereq. 04.381.*

04.383 Nuclear Technology III (2 cl., 2 q.h.)

The fission process and its applications; nuclear reactors — their classification design and application; nuclear fuel processing; radioactive waste disposal Supplementary laboratory experiments. *Prereq. 04.382.*

04.481 Nuclear Technology (4 cl., 4 q.h.)

Atomic and nuclear structure; discovery and nature of radioactivity. Nuclear reactions and energy; induced nuclear transformations, neutron properties Nuclear instrumentation for particle detection, monitoring, and experimentation. The fission process and its applications; nuclear reactors — their classification, design, and application. Supplementary laboratory experiments. *Prereq. 10.422 and 11.319.*

ENGINEERING GRAPHICS AND COMPUTATION

09.307 Electrical and Electronic Graphics I (2 cl., 2 q.h.)

Instrument techniques; principles of projection, drawing, reading and interpretation of multiview drawings; isometric, oblique, pictorial representations, auxiliary views and sections. Two hours of laboratory classes. *Prereq. none.*

09.308 Electrical and Electronic Graphics II (2 cl., 2 q.h.)

Auxiliary views, sections, dimensioning; introduction to electronic graphics, including: symbols, schematics, block and logic diagrams, production and cable drawings, military standards. *Prereq. 09.307.*

09.309 Electrical and Electronic Graphics III (2 cl., 2 q.h.)

A study of single- and double-sided printed circuit layout, integrated circuits, electro-mechanical designs, wiring, and interconnection diagrams; graphical data presentation. *Prereq. 09.308.*

09.311 Engineering Graphics I (2 cl., 2 q.h.)

Introduction to engineering drawing, geometric construction, charts and graphs, orthographic projection through auxiliary views. *Prereq. none.*

09.312 Engineering Graphics II (2 cl., 2 q.h.)

Detail drawing, including intersections and development, reading of multiview drawings, pictorial representation. *Prereq. 09.311.*

09.313 Engineering Graphics III (2 cl., 2 q.h.)

Manufacturing processes and dimensioning. Topographical, earth work, drawing analysis of assemblies, case studies in engineering design. *Prereq. 09.312.*

09.314 Engineering Design I (Kinematics) (1 cl., 2 lab., 2 q.h.)

Translatory and rotary motion involving basic mechanisms through graphical vector and mathematical analysis of displacement, velocity, and acceleration. Some redesign of existing mechanisms. Simple, compound, reverted, and epicyclic gear trains. *Prereq. 09.313, 11.317.*

09.315 Engineering Design II (1 cl.; 2 lab., 2 q.h.)

Drawings and specifications for the production and precision machining of castings, forging, weldments, etc. Discussion of design components. Prereq. 09.314.

09.316 Engineering Design III (1 cl., 2 lab., 2 q.h.)

Introduction to design through graphical analysis of cam and follower motions, and other mechanisms. Creativity and design processes through case studies and original projects requiring oral presentation of student's involvement in both synthesis and innovative activities. Prereq. 09.315.

09.351 Principles of Computer Programming I (2 cl., 2 q.h.)*

Rules for forming simple FORTRAN programs. Students write and run programs to compute: Fibonacci sequences, averages, kinematic displacements, and maxima and minima in both discrete and continuous cases. Batch programming in FORTRAN IV. Introduction to computer organization and machine language. Prereq. 10.308.

09.352 Principles of Computer Programming II (2 cl., 2 q.h.)*

Extended capabilities of the FORTRAN language, including: DO loops, subscripted variables and alphanumeric arrays. Students write and run application programs for printer plotting, sorting, matrix algebra and approximations. Batch programming in FORTRAN IV. Prereq. 09.351.

09.353 Principles of Computer Programming III (2 cl., 2 q.h.)*

Subroutine and function subprograms. Use of Scientific Subroutine Package with programming applications in probability, solution of simultaneous linear equations, root finding and quadrature. Introduction to use of plotter. Batch programming in FORTRAN IV. Prereq. 09.352.

9.354 Computer Systems I (Software Systems) (2 cl., 2 q.h.)

Storage and retrieval techniques, machine language and symbolic coding, discussion of ALGOL, BASIC and PL/1. Prereq. 09.353.

9.355 Computer Systems II (Hardware Systems) (2 cl., 2 q.h.)

Card readers, printers, plotters, and other output devices. Tapes, discs, drums and methods for computer files. Data communication equipment, COBOL, processing quality control, computer installation management.

9.356 Computer Systems III (Operating Systems) (2 cl., 2 q.h.)

Batch processing, time sharing, mixed systems and multiprogramming, Northeastern University's operating system-MASTER.

09.357 Computer Aided Design I (Computer Graphics) (2 cl., 2 q.h.)

Computer graphics programming. Using the computer to draw two and three dimensional shapes. Character generation and manipulation methods. Implementation on Northeastern's calcomp plotter. Prereq. 09.353.

09.358 Computer Aided Design II (Problem Oriented Languages) (2 cl., 2 q.h.)

Discussion of popular languages, user oriented requirements, input algorithms, command structure, design of a POL system. Prereq. 09.353.

09.359 Computer Aided Design III (Simulation and Mathematical models) (2 cl., 2 q.h.)

Random numbers programs to predict the outcome of probabilistic systems Computer models of deterministic systems. *Prereq.* 09.353.

09.361 Computer Controlled Systems I (2 cl., 2 q.h.)

Introduction to minicomputers. Minicomputers organization and logical components. Basic machine language programming. *Prereq.* 09.353.

09.362 Computer Controlled Systems II (2 cl., 2 q.h.)

Extended programming of minicomputers. The use of a minicomputer as an element in process control. Analysis of open and closed loop systems. *Prereq.* 09.361.

09.363 Computer Controlled Systems III (2 cl., 2 q.h.)

Specification of computer elements for a control system. Design and synthesis of a computer controlled system to meet process requirements. *Prereq.* 09.362.

09.401. Interpretation of Industrial Drawings (2 cl., 2 q.h.)

(See General Interest Courses, pages 152-153).

09.421 Principles of Computer Programming I (2 cl., 2 q.h.) (Day Curriculum)

Rules for forming simple FORTRAN programs. Basic input/output techniques. FORMAT control. Algorithms for solving simple scientific problems. Computing large sums; maxima and minima in both discrete and continuous cases. *Prereq.* 10.308 or concurrently.

09.422 Principles of Computer Programming II (2 cl., 2 q.h.)

(Day Curriculum)

Extended capabilities of the FORTRAN language. Manipulation of vectors and arrays. Subroutine and function subprogramming. Continued applications of computers, sorting, merging, root determination. A-Format. *Prereq.* 09.421.

09.423 Principles of Computer Programming III (2 cl., 2 q.h.)

(Day Curriculum)

Use of scientific subroutines, simulation, random numbers. Introduction to numerical methods (solution of simultaneous equations, quadrature, derivatives). Use of plotter language. Display of information. *Prereq.* 09.422.

09.461 Engineering Design Graphics I (2 cl., 2 q.h.)

(Day Curriculum)

Introduction to engineering drawing. Orthographic projection and primary auxiliary views. Reading and interpreting of multiview drawings. Isometric and oblique pictorial representation. *Prereq.* none.

09.462 Engineering Design Graphics II (2 cl., 2 q.h.)

(Day Curriculum)

Emphasis on engineering drawings required to support engineering design, including standard conventions, dimensioning, and basic production processes. Shop detail drawings are covered. Exercise in design processes are given through selected projects and case studies. *Prereq.* 09.461.

09.463 Engineering Design Graphics III (2 cl., 2 q.h.)

(Day Curriculum)

Greater involvement in design by examination of many commonly used components. Case studies of large systems discussed in class. Advanced design projects assigned. *Prereq.* 09.462.

09.464 Engineering Design Graphics IV (4 cl., 4 q.h.) (Day Curriculum)
 Graphical analysis of kinematic elements. Displacement, locus generators, velocity vectors, and sliding motion. Simple, compound, and reverted gear trains. Acceleration analysis of mechanisms such as cams and linkages. Functions and scales and nomographs. Introduction to self-correcting (feed-back) systems. *Prereq.* 09.463.

MATHEMATICS

10.301 Introduction to Mathematics I (4 cl., non-credit)

A comprehensive review of high school algebra including: first-degree equations, factoring, fractions, fractional equations, ratio and proportion, word problems, and concepts of plane geometry. *Prereq. none.*

10.302 Introduction to Mathematics II (4 cl., non-credit)

Algebraic operations with complex fractions, mixed expressions, square roots, radicals, quadratic equations; simultaneous equations, graphs and fractional zero and negative exponents. The geometry of the right triangle, areas of polygons, circles, and loci problems. Basic slide rule operation. *Prereq. 10.301.*

10.303 Introduction to Mathematics

An accelerated combination of 10.301 and 10.302. Primarily for day students.

10.307 College Algebra and Trigonometry I (4 cl., 4 q.h.)

Fundamental algebraic operations; radicals and exponents; functions; quadratic equations and applications; irrational equations; systems of equations; variation; binomial expansion. Trigonometric functions of angles in degrees; right triangles. *Prereq. Math. Placement Test or 10.302.*

10.308 College Algebra and Trigonometry II (4 cl., 4 q.h.)

Logarithms; applications of right triangles; radian measure; trigonometric identities and equations; oblique triangles. Inequalities; complex numbers; roots of polynomial equations. *Prereq. 10.307.*

10.316 Probability and Statistics I (2 cl., 2 q.h.)

Basic tools, e.g., sets, permutations and combinations; probability and applications. *Prereq. 10.308, or 10.329 or 10.335.*

10.317 Probability and Statistics II (2 cl., 2 q.h.)

Descriptive statistics; frequency distributions and probability density functions; normal and other distributions. *Prereq. 10.316.*

10.318 Probability and Statistics III (2 cl., 2 q.h.)

Bivariate distributions; correlation; statistical inference and estimation; regression. *Prereq. 10.317.*

10.320 Calculus I (4 cl., 4 q.h.)

Plane Analytic Geometry. Differentiation of algebraic functions. Rate, motion, maximum and minimum problems. Derivatives of higher order. Curve sketching. Basics in functions, limits and continuity. *Prereq. 10.308 or 10.329.*

10.321 Calculus II (2 cl., 2 q.h.)

Integration of algebraic functions. Integration and differentiation of logarithmic, exponential and trigonometric terms. Calculations of areas, volumes and length of arc by definite integrals. *Prereq. 10.320.*

10.322 Calculus III (2 cl., 2 q.h.)

Differentiation and integration of inverse trigonometric functions. Integration by parts, substitution, and tables. The Trapezoidal and Simpson Rules. The application of the differential and integral calculus to the Polar Coordinate System. Vectors in the plane. Indeterminate forms. *Prereq. 10.321.*

10.323 Calculus IV (2 cl., 2 q.h.)

Vectors in three-dimensional space. Functions of more than one variable. Partial differentiation. Multiple integration. Infinite series. Taylor's and MacLaurin's Formula. *Prereq. 10.322.*

10.324 Differential Equations I (2 cl., 2 q.h.)

Vector analysis; matrices and linear algebra. *Prereq. 10.323.*

10.325 Differential Equations II (2 cl., 2 q.h.)

Ordinary differential equations — standard types of the first order; linear differential equations, especially with constant coefficients. Variation of parameters. *Prereq. 10.324.*

10.326 Differential Equations III (2 cl., 2 q.h.)

Series solutions of differential equations; Laplace transforms, Fourier series, and orthogonal functions. *Prereq. 10.325.*

10.327 Mathematics I (2 cl., 2 q.h.)

Methods and applications of algebra; graphical techniques. *Prereq. Math Placement Test, 10.331 or 10.302.*

10.328 Mathematics II (2 cl., 2 q.h.)

Linear and quadratic equations; exponents and radicals; variation. *Prereq. 10.327.*

10.329 Mathematics III (2 cl., 2 q.h.)

Review of geometry; topics of trigonometry; introduction to statistics and probability; logarithms. *Prereq. 10.328.*

10.330 Basic Mathematics I (2 cl., non-credit)

A review of elementary algebra; algebraic expressions and operations, equations, word problems. *Prereq. none.*

10.331 Basic Mathematics II (2 cl., non-credit)

Further review; operations with polynomials, factoring, fractional expressions, word problems. *Prereq. 10.330.*

10.332 Mathematics for Business Management I (2 cl., 2 q.h.)

Introduction to mathematics underlying operations research, with emphasis on applications to business management logic, set theory. *Prereq. 10.329 or equiv.*

10.333 Mathematics for Business Management II (2 cl., 2 q.h.)

Probability and its uses in decision-making under uncertainty; introduction to vector and matrix algebra. *Prereq. 10.332 or equiv.*

10.334 Mathematics for Business Management III (2 cl., 2 q.h.)

Mathematics of finance, linear programming and optimization techniques, game theory. *Prereq. 10.333 or equiv.*

10.351 Advanced Mathematics I (Numerical Analysis) (2 cl., 2 q.h.)

Basic methods of numerical analysis — roots by iteration; approximating polynomials and interpolation; least squares fitting; numerical integration; approximate solution of ordinary differential equations — problems employing the electronic computer. *Prereq. 09.353 and 10.326.*

10.352 Advanced Mathematics II (2 cl., 2 q.h.)

Introduction to partial differential equations, boundary-value problems, Sturm-Liouville systems. *Prereq. 10.351.*

10.353 Advanced Mathematics III (2 cl., 2 q.h.)

Special topics in analysis. *Prereq. 10.352.*

10.361 Modern Algebra I (2 cl., 2 q.h.)

Sets; binary operations; mappings; rings, integers, fields; rationals; reals, bases for computer applications; Euclidean algorithm; primes. *Prereq. 10.308, 10.329 or 10.335.*

10.362 Modern Algebra II (2 cl., 2 q.h.)

Field of complex numbers; groups; subgroups; polynomial rings; homomorphisms; isomorphisms; ideals. *Prereq. 10.361.*

10.363 Modern Algebra III (2 cl., 2 q.h.)

Vectorspaces; linear transformations; dependence, independence; dimension applications to engineering, science, and business. *Prereq. 10.362.*

10.364 Modern Applied Algebra (4 cl., 4 q.h.)

Introduce the language of abstract algebra to the following topics: graphs, finite state machines, programming languages, Boolean Algebra, lattices, coding for communication channels and radar. Look at algebraic theory of linear systems, *Prereq. 10.361, 10.362 and 10.363.*

10.391 Mathematics — A (3 cl., 3 q.h.)

Methods and applications of algebra; graphical techniques. Linear and quadratic; exponents and radicals. (No credit to students who have passed 10.327, 10.328, or 10.335). *Prereq. Math. Placement Test, 10.302, or 10.331.*

10.392 Mathematics — B (3 cl., 3 q.h.)

Variation; review of geometry; topics of trigonometry; introduction to statistics and probability; logarithms. (No credit to students who have passed 10.329.) *Prereq. 10.391.*

10.401 Foundations of Mathematics I (2 cl., 2 q.h.)

See General Interest Courses, pages 152-153.)

10.402 Foundations of Mathematics II (2 cl., 2 q.h.)

See General Interest Courses, pages 152-153.)

10.403 Foundations of Mathematics III (2 cl., 2 q.h.)

See General Interest Courses, pages 152-153.)

10.421 Calculus — A (4 cl., 4 q.h.) (Day Curriculum)

Applications of derivatives to curve-sketching; antidifferentiation; the definite integral, with applications; calculus of non-algebraic functions — logarithmic, exponential, and trigonometric. Calculus of inverse trigonometric functions; techniques of integration; polar coordinates; the conic sections; vectors in a plane; indeterminate forms, L'Hospital's rule. *Prereq. 10.320.*

10.422 Calculus — B (3 cl., 4 q.h.) (Day Curriculum)
Calculus of functions of several variables, partial differentiation, multiple integrals, infinite series. Vector analysis; matrices and linear algebra. *Prereq. 10.421.*

10.423 Differential Equations (4 cl., 4 q.h.) (Day Curriculum)
Ordinary differential equations — standard types of the first order; linear differential equations, especially with constant coefficients; Laplace transforms series solutions of differential equations. Fourier series and orthogonal functions. *Prereq. 10.422.*

PHYSICS

Courses marked * not available in every curriculum. See curricula in Programs of Instruction section, for applicable sequence, pp. 57-98.

11.301 Introductory Physics I (4 cl., non-credit)

A survey of physical principles and theories related to field of mechanics. Emphasis is placed upon the solution of applied problems. *Prereq. none.*

11.302 Introductory Physics II (4 cl., non-credit)

Extension of principles in mechanics and introduction of concepts in heat, sound, light, electricity, and magnetism. *Prereq. 11.301.*

***11.304 General Physics I** (2 cl., 2 q.h.)

Survey of Newtonian mechanics; kinematics and dynamics of particle motion; projectile and circular motion; rotational motion, conservation laws of energy and momentum. *Prereq. 10.327 or concurrently.*

***11.305 General Physics II** (2 cl., 2 q.h.)

Temperature; heat energy; mechanical equivalent of heat; wave motion; sound; Doppler's effect; properties of light; simple optical systems. *Prereq. 11.304.*

***11.306 General Physics III** (2 cl., 2 q.h.)

Fundamentals of electricity and magnetism; fields; potential; electric current; inductance; capacitance; electromagnetism; a-c and d-c series circuits. *Prereq. 11.305.*

11.317 Physics I (Mechanics) (4 cl., 4 q.h.)

Kinematics and dynamics of particle motion; Newton's laws; projectile and circular motion; conservation laws for momentum and energy; rotational motion; simple harmonic motion. *Prereq. 10.307 or concurrently.*

11.318 Physics II (Wave Motion, Sound, Heat) (4 cl., 4 q.h.)

Wave motion; intensity; interference phenomena; Doppler effect; vibrating systems; temperature; heat; change of state; heat transfer; kinetic theory of gases; general gas laws; thermodynamics. *Prereq. 11.317.*

11.319 Physics III (Electricity, Magnetism, Light) (4 cl., 4 q.h.)

Electrostatics; magnetism; magnetic induction; induced currents; direct and alternating current circuits; properties of light; reflection; refraction; dispersion; optical systems; diffraction; polarization. *Prereq. 11.318.*

.320 Semiconductor Physics & Devices (4 cl., 4 q.h.)

electron Ballistics and applications. Properties of atoms and electrons as related to conduction of electricity in solids. Fundamentals of semiconductors, crystal diodes, and transistors. Theory of field-effect transistors, integrated circuits, and photoelectric devices. (This is a combination of 11.322 and .323.) *Prereq. 11.316, or 11.319.*

.321 Wave Phenomena (2 cl., 2 q.h.)

Application of fundamental principles of waves to electromagnetic radiation. Waves on transmission lines. Selected topics in antennas and wave guides. *Prereq. 11.319 or 11.316.*

.322 Semiconductor Physics I (2 cl., 2 q.h.)

electron Ballistics and applications. Properties of atoms and electrons as related to conduction of electricity in solids. *Prereq. 11.319.*

.323 Semiconductor Devices II (2 cl., 2 q.h.)

Fundamentals of semiconductors, crystal diodes, and transistors. Theory of field-effect transistors, integrated circuits and photoelectric devices. *Prereq. 11.322.*

.324 Introductory Survey of Lasers (2 cl., 2 q.h.)

Physical principles and technology will be emphasized. Course will include a view of the fundamental concepts of light and spectroscopy, the basic theory of lasers, studies of solid state; atomic, ionic and molecular gas; organic dye; and semiconductor lasers. Related optics and detection will be discussed. *Prereq. 11.319.*

.331 Modern Physics I (2 cl., 2 q.h.)

Introduction to theory of relativity; particle properties of waves; wave properties of particles; atomic structure; Bohr model of the atom. *Prereq. 11.306 or 11.319.*

.332 Modern Physics II (2 cl., 2 q.h.)

Quantum mechanics; electron spin; atomic spectra; complex atoms; solid state physics; lasers. *Prereq. 11.331.*

.333 Modern Physics III (2 cl., 2 q.h.)

Atomic nucleus; radioactive decay; thermonuclear energy; nuclear reactions; elementary particles. *Prereq. 11.332.*

.341 Physics Laboratory I (3 lab., 2 q.h.)

Experiments in dynamics, two-body kinematics and scattering, geometrical optics and thermodynamics. *Prereq. 11.319.*

.342 Physics Laboratory II (3 lab., 2 q.h.)

Experiments in physical optics, spectroscopy and quantum physics. *Prereq. 11.341.*

.343 Physics Laboratory III (3 lab., 2 q.h.)

Experiments in electricity and magnetism, simple electric and electronic circuits. *Prereq. 11.342.*

11.373 Physics Laboratory I (3 cl., 2 q.h.)

First quarter of a two quarter physics laboratory. Prereq. 11.305 or 11.318, concurrently.

11.374 Physics Laboratory II (3 cl., 2 q.h.)

A continuation of 11.373.

11.401 Man's Physical Environment I (2 cl., 2 q.h.)

(See General Interest Courses, pages 152-153.)

11.402 Man's Physical Environment II (2 cl., 2 q.h.)

(See General Interest Courses, pages 152-153.)

11.420 Physics IV (4 cl., 4 q.h.)

(Day Curriculum)

Application of fundamental principles of waves to electromagnetic radiation
Waves on transmission lines. Further study of wave motion topics from 11.318
Prereq. 11.319.

CHEMISTRY

Students wishing to elect other chemistry courses should refer to the University College Catalog and petition for approval by the Academic Standing Committee of Lincoln College.

12.501 Introductory Chemistry I (4 cl., non-credit)

A non-mathematical approach to the concepts of chemistry including matter, elements and compounds, chemical bonding, chemical equations. Prereq. None.

12.502 Introductory Chemistry II (4 cl., non-credit)

A continuation of 12.501, including periodic system, forms of energy, oxidation-reduction, solutions, chemical and ionic equilibrium, nuclear reactions, and brief introduction to organic chemistry. Prereq. 12.501 or equiv.

12.507 Modern Chemistry I (Intro. to Inorganic Chemistry) (2 cl., 2 q.h.)

Fundamental ideas of matter and energy, chemical bonding, chemical energy, water and solutions, colloids, ionic reactions, oxidation and reduction, acidity, radio activity, all discussed from the viewpoint of recent developments. Prereq. 10.327 or concurrently.

12.508 Modern Chemistry II (Intro. to Organic Chemistry) (2 cl., 2 q.h.)

Classes of organic compounds, including hydrocarbons, alcohols, ethers, aldehydes, ketones, carboxylic acids, esters, amines and amides, carbohydrates, including the relationship with modern biology. Prereq. 12.507 or equiv.

12.509 Modern Chemistry III (Intro. to the Chemistry of Living Bodies)

(2 cl., 2 q.h.)

Includes fats, proteins, enzymes, chemistry of digestion and the chemical reactions characteristic of body fluids. Prereq. 12.508 or equiv.

12.515 Biochemistry I (2 cl., 2 q.h.)

The first quarter of a three-quarter course sequence. The sequence will cover introduction to the biochemistry of the cell, including the occurrence, chemistry, and metabolism of carbohydrates, lipids, proteins, and nucleic acids. Prereq. 12.533 or equiv.

12.516 Biochemistry II (2 cl., 2 q.h.)

continuation of Biochemistry I. Prereq. 12.515.

12.517 Biochemistry III (2 cl., 2 q.h.)

continuation of Biochemistry II. Prereq. 12.516.

12.521 Analytical Chemistry I (2 cl., 2 q.h.)

analytical procedures and techniques. The principles of solution chemistry, acid equilibria, and oxidation potentials applied to solving problems in chemical analysis. Prereq. 12.546 and 12.549 or equiv.

12.522 Analytical Chemistry II (2 cl., 2 q.h.)

inciples and practice of gravimetric and titrimetric methods of analysis. Prereq. 12.521.

12.523 Analytical Chemistry III (2 cl., 2 q.h.)

theory of spectrophotometry, chromatography, and selected electro-analytical methods. Prereq. 12.522.

12.524 Analytical Chemistry Laboratory I (3 lab., 2 q.h.)

qualitative analysis. Separations by chemical means, chemical tests, and spot tests for inorganic ions in solution. Prereq. 12.521 or concurrently or equiv.

(Laboratory Fee)

12.525 Analytical Chemistry Laboratory II (3 lab., 2 q.h.)

chemical methods of quantitative analysis. Procedures and techniques of gravimetric and volumetric methods of chemical analysis. Prereq. 12.522 or concurrently or equiv.

(Laboratory Fee)

12.526 Analytical Chemistry Laboratory III (3 lab., 2 q.h.)

instrumental methods of analysis. Instruments and procedures for electro-kinetic and optical methods of chemical analysis. Prereq. 12.525 and 12.523 concurrently or equiv.

(Laboratory Fee)

12.531 Organic Chemistry I (2 cl., 2 q.h.)

structure of carbon in organic compounds. General principles of structure, nomenclature, preparation, uses, and reactions, of aliphatic hydrocarbons: alkanes, alkenes, alkynes, dienes, cycloalkanes. Position and geometric isomerism. Induction to free radical and ionic mechanisms of reactions. Prereq. 12.546 and 12.549 or equiv.

12.532 Organic Chemistry II (2 cl., 2 q.h.)

structure of benzene, electrophilic aromatic substitution reactions. General principles of structure, nomenclature, preparation, uses and reactions of the various types of organic compounds, including: alcohols, alkyl and aryl halides, ethers and epoxides, and carboxylic acids. Optical isomerism and introductory chemical kinetics will be discussed. Prereq. 12.531 or equiv.

12.533 Organic Chemistry III (2 cl., 2 q.h.)

continuation of Chemistry 12.532 with emphasis on the application of chemical interconversions to synthetic problems. Functional derivatives of carboxylic acids, sulfonic acids and their derivatives, amines, diazonium compounds, enols, aldehydes and ketones. Prereq. 12.532 or equiv.

12.534 Organic Chemistry Laboratory I (3 lab., 2 q.h.)

Co-ordinated with the lecture course, Organic Chemistry I, and deals with the preparation and properties of compounds discussed. *Prereq. 12.546 or equiv. and 12.531 or concurrently.*

12.535 Organic Chemistry Laboratory II (3 lab., 2 q.h.)

Co-ordinated with the lecture course, Organic Chemistry II, and deals with the preparation and properties of compounds discussed. *Prereq. 12.534. or equiv. (Laboratory Fee)*

12.536 Organic Chemistry Laboratory III (3 lab., 2 q.h.)

Co-ordinated with the lecture course, Organic Chemistry III, and deals with the preparation and properties of compounds discussed. *Prereq. 12.535 or equiv. (Laboratory Fee)*

12.541 Physical Chemistry I (2 cl., 2 q.h.)

The three states of matter, atomic and molecular forces, physical properties and molecular structure; heat, work and heat capacity; thermochemistry. *Prereq. 12.513, 12.516, 10.323 or 11.306.*

12.542 Physical Chemistry II (2 cl., 2 q.h.)

Thermodynamics, solutions, chemical equilibria, phase diagrams, and chemical kinetics. *Prereq. 12.541 or equiv.*

12.543 Physical Chemistry III (2 cl., 2 q.h.)

Electrical conductance, electromotive force, ionic equilibria, colloids, quantum theory, and photochemistry. *Prereq. 12.542 or equiv.*

12.544 General Chemistry I (2 cl., 2 q.h.)

Fundamental concepts; symbols, formulas, and equations; atomic structure and Periodic Law, chemical bonding; oxygen, ozone, and hydrogen; the gaseous state and gram mole volume; the liquid and solid states; water and hydrogen peroxide. *Prereq. 10.307 or 10.327 or concurrently or equiv. (Not open to those students with credit for 12.311 or 12.314.)*

12.545 General Chemistry II (2 cl., 2 q.h.)

Solutions, solutions of electrolytes, colloids, oxidation and reduction reactions, periodic properties, halogens, chemical equilibrium, electrochemistry; acids, bases, and salts; sulfur family. *Prereq. 12.544 or equiv. (Not open to those students with credit for 12.512 or 12.515.)*

12.546 General Chemistry III (2 cl., 2 q.h.)

Ionic equilibrium and weak electrolytes; solubility product principle, hydrolysis. Nitrogen, phosphorous, and their compounds; boron, silicon, and their compounds; alkali and alkaline earth metals, metals of groups III and IV. Nuclear chemistry. Carbon and its compounds. Biochemistry. *Prereq. 12.545 or equiv. (Not open to those students with credit for 12.513 or 12.516.)*

12.547 General Chemistry Laboratory I (2 lab., 1 q.h.)

Co-ordinated with the lecture course, General Chemistry I, and deals with the preparation and properties of elements and compounds discussed. *Prereq. 12.544 or concurrently or equiv. (Not open to those students with credit for 12.514.) (Laboratory Fee)*

.548 General Chemistry Laboratory II (2 lab., 1 q.h.)

-ordinated with the lecture course, General Chemistry II, and deals with the separation and properties of elements and compounds discussed. *Prereq.*

.547 or equiv. (*Not open to those students with credit for 12.315.*)

(Laboratory Fee)

.549 General Chemistry Laboratory III (2 lab., 1 q.h.)

alitative analysis experiments, including unknown solutions. *Prereq.* 12.548 equiv. (*Not open to those students with credit for 12.316*) (Laboratory Fee)

.551 Instrumental and Radiochemistry I (2 cl., 2 q.h.)

definitions, physical principles, scope and application; principles of measurement; endpoint-detection systems for volumetric analysis, data treatment and interpretation. Optical methods of analysis including spectrophotometry, excitation methods, measurements of other optical properties, and mass spectrometry. *Prereq.* 12.523 or equiv.

.552 Instrumental and Radiochemistry II (2 cl., 2 q.h.)

Methods of separation, vapor phase chromatography, ion exchangers; electrical methods of analysis including potentiometry, voltammetry, coulometry, and conductometry; miscellaneous instrumental measurements. *Prereq.* 12.551 or equiv.

.553 Instrumental and Radiochemistry III (2 cl., 2 q.h.)

adioactivity and nuclear reactions, production and study of nuclear reactions, equations of radioactive decay, nuclear states and radioactive processes, interaction of radiations with matter, radiation detection and measurement, statistics of radioactivity measurements, techniques for the study of radionuclides, uses in chemical applications and nuclear energy. *Prereq.* 12.552 or equiv.

.554 Physical Chemistry Laboratory I (3 cl., 2 q.h.)

perimental studies of viscosity, thermochemistry, and homogeneous equilibrium. *Prereq.* 12.542. (Laboratory Fee)

.555 Physical Chemistry Laboratory II (3 cl., 2 q.h.)

perimental studies of phase equilibrium, solution thermodynamics and chemical kinetics. *Prereq.* 12.554. (Laboratory Fee)

EARTH SCIENCE

Students wishing to elect other earth science courses should refer to the University College Catalog and petition for approval by the Academic Standing Committee of Lincoln College.

.531 Oceanography I (2 cl., 2 q.h.)

Introduction to the geology of the ocean basins and the physical and chemical properties of sea water. The development of ocean currents and their effect on the land masses of the world. *Prereq.* Earth Sci. I or equiv.

.532 Oceanography II (2 cl., 2 q.h.)

The habitat zones and organisms of the sea. Phytoplankton, zooplankton, and plankton are discussed. The growing economic importance of marine resources for the expanding world population. *Prereq.* 16.531 or equiv.

16.533 Marine Geology (2 cl., 2 q.h.)

Physiography and structure of ocean basins. Marine geological processes and features, including sedimentation, erosion, shorelines, and bottom topography. Methods and techniques of marine geological exploration. *Prereq. Earth Sci. or equiv.*

BIOLOGY

Students wishing to elect other biology courses should refer to the University College Catalog and petition for approval by the Academic Standing Committee of Lincoln College.

18.507 Gross Anatomy and General Physiology I (2 cl., 2 q.h.)

Fundamental concepts of living organisms, chemical and biological characteristics of cellular metabolism. The skeletal system and its appendages. General nomenclature, anatomical names and terms. *Prereq. none.*

18.508 Gross Anatomy and General Physiology II (2 cl., 2 q.h.)

The systems of the body and the relationships between them. The structure and function of each. *Prereq. 18.507 or equiv.*

18.509 Gross Anatomy and General Physiology III (2 cl., 2 q.h.)

Continuation of the systems of the body and the relationship between them. *Prereq. 18.508 or equiv.*

18.511 Biology I (General) (3 cl., lab., 4 q.h.)

Universal properties and processes of living organisms. Cellular composition and cellular activities; inheritance and cellular control; the evolutionary process and environmental relationships. *Prereq. none.* (Laboratory fee)

18.512 Biology II (Animal) (3 cl., 3 lab., 4 q.h.)

Systematic comparative study of the structure and functions of animals. Diversity of animals considered from the standpoint of evolutionary adaptation. *Prereq. 18.511 or equiv.* (Laboratory Fee)

18.513 Biology III (3 cl., 3 lab., 4 q.h.)

A continuation of the study of animal biology. *Prereq. 18.512* (Laboratory Fee)

18.521 Microbiology I (2 cl., 4 lab., 4 q.h.)

Morphology and biochemistry of the bacteria. *Prereq. 18.513 or equiv.* (Laboratory Fee)

18.522 Microbiology II (2 cl., 4 lab., 4 q.h.)

Biology of the protists; the role of microorganisms in the environment. *Prereq. 18.521 or equiv.* (Laboratory Fee)

18.523 Microbiology III (2 cl., 4 lab., 4 q.h.)

Survey of pathogenic microorganism. (Laboratory Fee)

18.524 Human Anatomy and Physiology I (2 cl., 2 lab., 3 q.h.)

Introduction to human anatomy, osteology, anatomy of the muscular system, respiratory system, digestive system, the vascular system, urogenital system. The laboratory includes a study of human bones and cat dissection. *Prereq. 18.306 or 18.513 or equiv.*

1.525 Human Anatomy and Physiology II (2 cl., 2 lab., 3 q.h.)

Principles of physiology and continuation of the study of human anatomy. The laboratory is mainly concerned with muscle physiology. *Prereq.* 18.524 or equiv. (Laboratory Fee)

1.526 Human Anatomy and Physiology III (2 cl., 2 lab., 3 q.h.)

Continuation of the principles of physiology. The anatomy and physiology of the nervous system, physiology of the endocrine system. The laboratory deals with physiology of respiration and the physiology of blood. *Prereq.* 18.525 or equiv. (Laboratory Fee)

1.560 Environmental Ecology (4 cl., 4 q.h.)

Biotic and abiotic aspects of the environment. Geo-physico-chemocycles in the biosphere. Food chain and the ecosystem. Energy cycling. Environmental pollution. Population explosion and natural resources. Future of man as a species. Role of government, industry, and individuals in controlling the environment. *Prereq. none.*

1.561 Ecology I (2 cl., 2 q.h.)

Environmental factors. The soil system. Water. The atmosphere. Temperature, light, wind, pressure. The physico-chemical factors — CO₂, N and mineral nutrients. Habitat. Distribution of plants and animals in the world according to temperature and precipitation. *Prereq. 18.513 or equiv.*

1.562 Ecology II (2 cl., 2 q.h.)

The ecosystem. Ecological niche. The producers, consumers, and decomposers. The pond ecosystem, desert ecosystem, forest ecosystem, and sea shore ecosystem. Energy cycle and efficiency of energy utilization. Mass, weight, and energy pyramids. *Prereq. 18.561 or equiv.*

1.563 Ecology III (2 cl., 2 q.h.)

Population ecology. Biotic community. Population growth. Relations between species. Symbiosis. Competition. Predation. Succession. *Prereq. 18.562 or equiv.*

3.564 Man and his Biosphere I (2 cl., 2 q.h.)

An ecological analysis of the human situation and man's interaction with other organisms. The necessary foundation of biological principles will be presented.

3.565 Man and His Biosphere II (2 cl., 2 q.h.)

Continuation of Man and Environment I. The problems discussed are individual and separable from the subject matter of Part I and may be elected without having had 18.564.

LIBERAL ARTS

Students wishing to elect other humanities, social science, and natural science courses should refer to the University College Catalog and petition for approval by the Academic Standing Committee of Lincoln College.

19.501 Psychology I (2 cl., 2 q.h.)

An introductory survey of the historical backgrounds of psychology, psychological measurement and testing, and principles of animal and human learning. *Prereq. none.*

19.502 Psychology II (2 cl., 2 q.h.)

Principles of sensory processing, perception, motivation and emotion, and social influences on behavior. *Prereq. 19.501 or equivalent.*

19.503 Psychology III (2 cl., 2 q.h.)

Personality theory and measurement, behavior disorders, mental health, and psychotherapy. *Prereq. 19.502 or equivalent.*

19.507 Psychology (Intensive) (6 cl., 6 q.h.)

An introductory survey of the historical backgrounds of psychology, psychological measurement and testing, and principles of animal and human learning. Principles of sensory processing, perception, motivation and emotion, and social influences on behavior. Personality theory and measurement, behavior disorders, mental health, and psychotherapy. (Not open to students who have taken 19.501, 19.502, 19.503.) *Prereq. none.*

19.508 Fundamentals of Psychology I (4 q.h.)

Basic concepts from most areas of psychological investigation; the experimental orientation to the study of behavior, including child development, individual differences, learning, and social psychology. (Recommended for psychology majors.) *(Not open to students who have credit for 19.501, 502, 503.)*

19.509 Fundamentals of Psychology II (4 q.h.)

The sensory basis of behavior, cognition, perception, motivation, emotions normal and abnormal personality. (Recommended for psychology majors. *Prereq. 19.508 or equiv. (Not open to students who have credit for 19.501, 502, 503.)*

21.501 Sociology I (2 cl., 2 q.h.)

Basic concepts and theories relating to the study of man as a participant in group life with emphasis on social structure, culture, socialization, and the family.

21.502 Sociology II (2 cl., 2 q.h.)

A continuation of Sociology I with major emphasis on primary groups, associations, social stratification, collective behavior, and population. *Prereq. 21.501 or equivalent.*

21.503 Sociology III (2 cl., 2 q.h.)

A continuation of Sociology II focusing on the major institutional areas, with particular attention to problems of social, political, urban, and industrial change. *Prereq. 21.502 or equivalent.*

21.504 Sociology (Intensive) (6 cl., 6 q.h.)

Basic concepts and theories relating to the study of man as a participant in group life with emphasis on social structure, culture, socialization, and the family. Primary groups, associations, social stratification, collective behavior and population. The major institutional areas, with particular attention to problems of social, political, urban, and industrial change. (Not open to students who have taken 21.501, 21.502, 21.503.)

1.601 Principles of Sociology I (4 q.h.)

An intensive introduction to basic concepts and theories relating to the study of man as a participant in group life. Emphasis is placed on socialization, culture, social structure, primary groups, family, social stratification, and population.

1.602 Principles of Sociology II (4 q.h.)

A continuation of Principles of Sociology I with emphasis on a critical analysis of American society with particular attention to problems of social, political, urban, and industrial change. *Prereq. 21.601 or equiv.*

1.501 Western Civilization I (2 q.h.)

The beginnings of Western Civilization with emphasis on the political, economic, and social history of ancient and medieval times to 1300.

1.502 Western Civilization II (2 q.h.)

Early Modern Europe from 1300 to 1789 with an examination of the two major intellectual movements, the Renaissance and the Enlightenment, and their impact on the rise of national states, capitalism, and Protestantism.

1.503 Western Civilization III (2 q.h.)

Modern Europe from 1789 to the present emphasizing the rise of ideology in a technological age.

1.507 Western Civilization (Intensive) (6 cl., 6 q.h.)

The beginnings of Western civilization with emphasis on the political, economic, and social history of the ancient and medieval world. Modern Europe to 1815 with an examination of the two major intellectual movements — the Renaissance and the Enlightenment — and their impact upon religious movements, economic developments, and the rise of national states. Western civilization since 1815, emphasizing the Scientific and Industrial Revolutions and their impact upon democracy and authoritarianism, nationalism and internationalism, and war and peace. (Not open to students who have taken 23.501, 23.502, 23.503.) *Prereq. none.*

1.509 Western Civilization A (3 q.h.)

Western Civilization to 1648.

1.510 Western Civilization B (3 q.h.)

Western Civilization since 1648.

1.541 Drawing I (3 q.h.)

Practice in the techniques and development of drawing in pencil and pen and ink, with concentration on basic drawing problems.

1.542 Drawing II (3 q.h.)

Practice in the techniques of wash drawing, scratch board drawing, and mixed media. *Prereq. 27.541 or equiv.*

1.543 Drawing III (3 q.h.)

Study of human anatomy and the practice of figure drawing and composition. *Prereq. 27.542 or equiv.*

93.401 Technical Communications (4 cl., 4 q.h.)

Thought organization and effective sentences. Written reports and instruction manuals. Specifications and proposals. Graphics aids and reproduction processes. *Prereq. none.*

30.501 English for International Students I (2 cl., non-credit)

Introduction to English grammar for foreign-speaking students with an emphasis on listening, speaking, and writing; selected readings and exercises to strengthen vocabulary and pronunciation. *Prereq. none.*

30.502 English for International Students II (2 cl., non-credit)

A continuation for 30.501 emphasizing the preparation of written and oral reports and business and social correspondence. *Prereq. 30.501.*

30.503 English for International Students III (2 cl., non-credit)

Advanced work in written and spoken English preparatory to entering 30.504 English I. *Prereq. 30.502.*

***30.594 English — A** (3 cl., 3 q.h.)

Aims and methods of exposition, description and narration; investigation of phrasing and syntax; analysis of essays for content, structure, and effectiveness; theme assignments to develop skill in writing. Aims and methods of argumentation; study of documentation techniques, form, and style of critical essays. *Prereq. none.*

30.595 English — B (3 cl., 3 q.h.)

Practice in library research; analysis and discussion of essays; theme assignments. Continuation of study of documentation techniques and form and style of critical essays.; writing business and social correspondence; theme assignments. *Prereq. 30.594.*

30.600 Elements of Composition (2 q.h.)

An intensive study of grammatical forms and structural patterns of current English.

30.601 Composition and Rhetoric I (2 q.h.)

A detailed examination of the modes of rhetoric, especially exposition and argument, and the exercises in the development of paragraphs and short papers. *Prereq. English Placement Test. (Not open for students who have credit for 30.504.)*

30.602 Composition and Rhetoric II (2 q.h.)

A continuation of 30.601. The stress here is on the short paper, the longer library paper, and formal documentation. *Prereq. 30.601. (Not open for students who have credit for 30.505.)*

30.603 Composition and Rhetoric (Intensive) (4 q.h.)

Same as 30.601 plus 30.602.

30.604 Introduction to Literary Forms I (2 q.h.)

The development of techniques for reading imaginative writing. Short and long fiction are the materials for study, discussion, and two critical papers. *Prereq. 30.602.*

.605 Introduction to Literary Forms II (2 q.h.)

continuation of 30.604, but here the materials are poetry and drama. *Prereq.* 30.604.

.606 Introduction to Literary Forms (Intensive) (4 q.h.)

me as 30.604 plus 30.605.

ch student enrolled in Composition and Rhetoric (30.601 and 30.603) will take a Placement Examination during class. Some students may be requested to register for Elements of Composition (30.600) a 2 q.h. course designed to grade the student's background.

ourses required for Liberal Arts Majors are:

30.601, 30.602 Composition and Rhetoric I & II (or 30.603 Intensive)
and

30.604, 30.605 Introduction to Literary Forms I & II (or 30.606 Intensive)

r other majors, refer to English requirement listed under major.

.113 Freshman Writing (4 cl., 4 q.h.)

portant principles of logic and rhetoric applied to exposition and argumentation writing; review of sentence structure, punctuation, and paragraphing; intensive reading and analysis of the essay form; theme assignments.

.114 Introduction to Literature (4 cl., 4 q.h.)

introduction to literary forms: poetry, prose fiction, and drama. Intensive reading in various forms, and discussion of different approaches to literature. *Prereq.* 30.113.

.115 Great Themes in Literature (4 cl., 4 q.h.)

ntent determined by instructor, who chooses a theme and a number of books from different periods to illustrate it. Examples: The Hero in Literature; Visions of Utopia; Science Fiction, etc. *Prereq.* 30.114.

BUSINESS MANAGEMENT

Students wishing to elect other business courses should refer to the University College Catalogue and petition for approval by the Committee on Education at Lincoln College.

.501 Economic Principles and Problems I (2 cl., 2 q.h.)

macro analysis-National income concepts and determination; macro economic models and problems; monetary and fiscal policy. *Prereq. none.*

.502 Economic Principles and Problems II (2 cl., 2 q.h.)

micro analysis-theory of the firm and market structure; supply, demand, market price; international economics. *Prereq. 39.501.*

.503 Economic Principles and Problems III (2 cl., 2 q.h.)

Applications of economic principles to selected problem areas; poverty, competition, labor, agriculture, urban. *Prereq. 39.502.*

39.105 Principles of Economics (4 cl.; 4 q.h.)

Development of macroeconomic analysis; review of national income concepts; national income determination, fluctuation, and growth; role of the banking system and the Federal Reserve System; government expenditures and taxation; international trade; balance of international payments.

39.504 Economics (Intensive) (6 cl., 6 q.h.)

Macro analysis-national income concepts and determination; macro economic goals and problems; monetary and fiscal policy. Micro analysis-theory of the firm and market structure; supply, demand, market price; international economics. Applications of economic principles to selected problem areas; poverty, competition, labor, agriculture, urban. *Prereq. none. (Not open to students who have taken 39.501, 39.502, 39.503.)*

39.510 Statistics for Quality Control (2 cl., 2 q.h.)

Fundamentals of statistical concepts and computations necessary to the understanding of statistical quality control. Frequency distributions, measures of centering and dispersion; computation of average and standard deviation for ungrouped and grouped data; determination of areas under the normal distribution curve; standard deviation of the mean. Combinations and permutations and their use of computer probabilities computations associated with the hypergeometric, binomial, and Poisson distributions. *Prereq. 10.503 or equiv.*

39.511 Statistics I (2 cl., 2 q.h.)

Introduction to the collection and organization of data. Concentration on the nature, computation, and uses of measures of central tendency and variability. *Prereq. 39.503.*

39.512 Statistics II (2 cl., 2 q.h.)

Introduction to statistical inference, parameters of samples, tests of significance, "t" distribution and chi square. *Prereq. 39.511.*

39.513 Statistics III (2 cl., 2 q.h.)

Introduction to the analysis of variance, trend fitting, linear regression, seasonal adjustment and index numbers. *Prereq. 39.512.*

39.514 Statistics (Intensive) (6 cl., 6 q.h.)

Introduction to the collection and organization of data. Concentration on the nature, computation, and uses of measures of central tendency and variability. Introduction to statistical inference, parameters of samples, tests of significance, "t" distribution and chi square. Introduction to the analysis of variance, trend fitting, linear regression, seasonal adjustment and index numbers. *Prereq. 39.503. (Not open to students who have taken 39.511, 39.512, 39.513.)*

41.501 Accounting Principles I (2 cl., 2 q.h.)

The basic concepts and methodology of accounting for service and merchandising businesses. *Prereq. none.*

41.502 Accounting Principles II (2 cl., 2 q.h.)

The problems of income measurement and valuation related to sources and uses of invested capital. *Prereq. 41.501.*

41.503 Accounting Principles III (2 cl., 2 q.h.)

The use of debt and investments in managerial financial decisions, followed by a brief introduction into cost decision analysis. *Prereq. 41.502.*

41.541 Accounting Principles (Intensive) (6 q.h.)

Basic concepts and methodology of accounting for service and merchandising businesses. The problems of income measurement and valuation related to sources and uses of invested capital. The use of debt and investments in managerial financial decisions, followed by a brief introduction into cost decision analysis. (*Not open to students who have taken 41.501, 41.502, 41.503.*)

45.501 Management and Organization I (2 cl., 2 q.h.)

Course describes the environment within which business operates and from this develops the theory and practice of organization. *Prereq. none.*

45.502 Management and Organization II (2 cl., 2 q.h.)

Building on 45.501, this course develops the "what" and "how" of the management process. *Prereq. 45.501.*

45.503 Management and Organization III (2 cl., 2 q.h.)

This course applies the concepts of organization and management to the functional areas of business — marketing, production, personnel and finance. *Prereq. 45.502*

45.541 Law I (2 cl., 2 q.h.)

CONTRACTS: Nature, kinds, and formation of contracts; essential elements; interpretation of contracts. *Prereq. none.*

45.542 Law II (2 cl., 2 q.h.)

AGENCY: Nature, formation and termination of agency relationships; rights and duties of principal and agent; scope of agent's authority. *Prereq. 45.541.*

SALES: Nature of sales contracts; warranties; transfer of title; rights and remedies of seller and buyer. *Prereq. 45.541.*

45.543 Law III (2 cl., 2 q.h.)

NEGOTIABLE INSTRUMENTS: Bills, notes and checks; liabilities and defenses of parties; procedure upon dishonor; discharge. *Prereq. 45.542.*

BUSINESS ORGANIZATIONS: Survey of corporations and partnerships. *Prereq. 45.542.*

45.643 Law (Intensive) (6 q.h.)

CONTRACTS: Nature, kinds, and formation of contracts; essential elements; interpretation of contracts. AGENCY: Nature, formation and termination of agency relationships; rights and duties of principal and agent; scope of agent's authority. SALES: Nature of sales contracts; warranties; transfer of title; rights and remedies of seller and buyer. NEGOTIABLE INSTRUMENTS: Bills, notes and checks; liabilities and defenses of parties; procedure upon dishonor; discharge. BUSINESS ORGANIZATIONS: Survey of corporations and partnerships.

Not open to students who have taken 45.541, 45.542, 45.543.

45.561 Statistical Quality Control (2 cl., 2 q.h.)

Description and practical application of the basic statistical quality-control methods for quality assurance, quality control, and quality improvement of products and services; the tools for reducing and controlling the costs of scrap, rework, repair, customer complaints, and warranty. The determination of process capability; use of histograms to identify abnormal variability; the use of quality-control charts for measurable and nonmeasurable quality characteristics, including Shewhart, Multi-Vari, median, percent defective and defects per unit; corrective-action techniques; complying with government quality-control-system requirements; psychological factors in controlling quality. *Prereq. 45.635 or 39.513.*

45.562 Statistical Quality Control II (2 cl., 2 q.h.)

Continuation of Statistical Quality Control I, covering the application of statistical and probability considerations in acceptance sampling of purchased material, work-in-process, and outgoing products. Methods of predicting sampling results using the hypergeometric, the binomial, and the Poisson distributions; development of the operating characteristic curve for any sampling plan; risks involved in sampling and the concepts of AQL, RQL, AOQL. Use of standard sampling tables to select appropriate sampling plans, including Mil-Std-105 and 414; practical administration of sampling programs, material review boards, and quality audit. *Prereq.* 45.561.

45.563 Management of Quality Control (2 cl., 2 q.h.)

Modern concepts of managing the quality function of a company to maximize customer satisfaction at minimum quality cost. The idea of total quality control; measurement of the costs of quality; use of Pareto's Rule to identify the major unsolved quality problems, development of a coordinated program of improvement, organizing for diagnosing the direct causes. The quality control system; improvement and control of vendor quality in process control; outgoing product control; customer quality relations. Organizing of the quality function.

45.608 Quality Control (Intensive) (6 q.h.)

Description and practical application of the basic statistical quality-control methods for quality assurance, quality control and quality improvement of products and services; the determination of process capability; the use of quality control charts for measurable and non-measurable quality characteristics. The application of statistical and probability considerations in acceptance sampling of purchased material, work in process, and outgoing products. Methods of predicting sampling results using the hypergeometric, the binomial, and the Poisson distributions; development of the operating characteristic curve for any sampling plan; risks involved in sampling and the concepts of AQL, RQL, AOQL. Not open to students who have taken 45.561, 45.562, 45.563. *Prereq.* 39.513.

45.570 Electronic Data Processing I (2 cl., 2 q.h.)

An introduction to computers including the discussion of numbering and coding systems; examples of typical business problems; and study of basic programming concepts. *Prereq. none.*

45.571 Electronic Data Processing II (2 cl., 2 q.h.)

A survey of available computer systems; price and performance comparison of available input, output, and storage media; discussion of filing and sorting techniques; and presentation of data communications concepts and terminals. *Prereq. 45.570.*

45.572 Electronic Data Processing III (2 cl., 2 q.h.)

A presentation of COBOL, FORTRAN and other programming languages; discussion of business data processing and operations research applications; and a summary of trends in EDP. *Prereq. 45.571.*

45.648 Electronic Data Processing (Intensive) (6 q.h.)

An introduction to computers including the discussion of numbering and coding systems; examples of typical business problems; a study of basic programming concepts. A survey of available computer systems; price and performance comparison of available input, output, and storage media; discussion of

file and sorting techniques; and presentation of data communications concepts and terminals. A presentation of COBOL, FORTRAN and other programming languages; discussion of business data processing and operations research applications; and a summary of trends in EDP. Not open to students who have taken 45.570, 45.571, 45.572.

48.501 Transportation Management I (2 cl., 2 q.h.)

Basic principles of management and organization, evaluation of all transportation modes, and primary concepts of freight classification and rates. *Prereq. none.*

48.502 Transportation Management II (2 cl., 2 q.h.)

Study of primary management functions — use of tariffs, routing, document processing, analysis of special carrier services and liabilities, and control of private carrier operations. *Prereq. 48.501.*

48.503 Transportation Management III (2 cl., 2 q.h.)

Appraisal of federal transport policy and introduction to factors of physical distribution — inventory control, warehousing, material handling, packaging, and international distribution. *Prereq. 48.502.*

48.504 Transportation Regulation and Promotion I (2 cl., 2 q.h.)

Study of the history and content of the Interstate Commerce Act. *Prereq. 48.503.*

48.505 Transportation Regulation and Promotion II (2 cl., 2 q.h.)

Examination of Administrative Law and Procedure, the Code of Ethics and the General Rules of Practice. *Prereq. 48.504.*

48.506 Transportation Regulation and Promotion III (2 cl., 2 q.h.)

Analysis of cases pertinent to the Commerce Clause and comprehensive preparation for the Interstate Commerce Commission Practitioners Examination. *Prereq. 48.505.*

48.514 Elements of Transportation and Distribution (2 q.h.)

An introduction to regulatory, economic, and management aspects of transportation from the viewpoints of shippers, government, and carrier managers. Topics include: costs, rates, operations, entry, mergers, intercity passenger and urban transportation. A course of general interest to students of business, law or government. *Prereq. none.*

48.591 Transportation Management A (3 cl., 3 q.h.)

Evaluation of all transportation modes, singly and in combination with one another. Analysis of the bill of lading and other transportation documents. Study of primary concepts in transportation pricing; freight classification, classification rule, and freight rates. Study of primary freight-management functions; use of tariffs and rate procedure with carrier bureaus and the Interstate Commerce Commission; routing and consolidation of freight. *Prereq. none.*

48.592 Transportation Management B (3 cl., 3 q.h.)

Special services performed by carriers — diversion and reconsignment, transit, protective services, storage, tracing, switching, pickup and delivery, weighing, loading and unloading; freight — claim procedure and prevention. Management of a private transportation system; exporting and importing; inventory management; materials handling and packaging; warehousing; and factors of industrial location. *Prereq. 48.591.*

48.593 Air Transportation Management A (3 cl., 3 q.h.)

The economics and regulation of scheduled passenger service and scheduled cargo service. Corporate and general aviation policy-making and procedures
Prereq. none.

48.594 Air Transportation Management B (3 cl., 3 q.h.)

Areas of specific study include route structures, equipment, scheduling, operations, pricing, cost analysis, and financing. *Prereq. 48.593.*

FIRE TECHNOLOGY

91.301 Fire Protection Science I (2 cl., 2 q.h.)

An overall review of the fire protection field with the object of providing career orientation. *Prereq. none.*

91.302 Fire Protection Science II (2 cl., 2 q.h.)

An overall review of the public fire service. A study of the basic organization, manpower, and utilization of equipment by municipal fire departments. *Prereq. 91.301.*

91.303 Chemistry of Fires and Explosions (2 cl., 2 q.h.)

A study of the chemistry and physics of fire and some of the common hazards. Electrical fires and fires caused by spontaneous heating and ignition are studied as well as flammable liquids, gases, and hazardous chemicals. Field and laboratory investigation of fires are included along with explosions, explosives, and field and laboratory investigations of explosions. *Prereq. 91.302.*

91.304 Fire Prevention I (2 cl., 2 q.h.)

Eliminating human and economic fire losses. Application of empirical and research knowledge in fire prevention measures. *Prereq. none.*

91.305 Fire Prevention II (2 cl., 2 q.h.)

An overview of collaborative efforts, and developing requirements and opportunities, in the interest of fire prevention and its corollary loss control. *Prereq. 91.304.*

91.306 Fire Apparatus Function and Design (2 cl., 2 q.h.)

An analysis of the procurement policies that should be followed in acquiring fire fighting apparatus and equipment with details on the type and amount for good fire fighting efficiency including a discussion of fire department buildings. A review of the physical properties of water that are pertinent to hydraulic calculations and a discussion of hose, streams, and nozzles. *Prereq. none.*

91.307 Fire Protection Systems I (2 cl., 2 q.h.)

A study of the theories and mechanics involved in the operation of fire protection systems and equipment. Fire detection and extinguishing systems of both automatic and manual types are studied including sprinkler, standpipe systems, and water spray protection. *Prereq. none.*

91.308 Fire Protection Systems II (2 cl., 2 q.h.)

A study of fire detection and suppression systems of the manual and automatic type. Types of alarm systems, detectors and actuators are studied and also systems using dry chemicals, carbon dioxide, foam and Halon 1301. Explosion prevention and suppression systems for buildings are also included. *Prereq. 91.307.*

1.309 Fire Service Operations I (2 cl., 2 q.h.)

Fire service operations, its goal and objectives. Management of fire service operations and various aspects of planning, organizing, delegation, staffing, implementing, directing, and controlling. Systems approach to fire service management with management exercises. *Prereq. none.*

1.310 Fire Service Operation II (2 cl., 2 q.h.)

Course Description: Fire Service operation with respect to government and collective bargaining, leadership and discipline, performance analysis, communications and the importance of listening, effective speaking and reporting, records and budgets. Fire service operation public relations in the community and the press. *Prereq. 91.309.*

1.311 Fire Service Operations III (2 cl., 2 q.h.)

Fire defense planning and development. Determining fire defense requirements, organizing the defense and training programs. The fire officer as an instructor, evolution of system, strategy, tactics and other types of emergencies. *Prereq. 91.310.*

1.312 Environmental Physiology (2 cl., 2 q.h.)

Fundamental principles in Human Physiology and the relationship of man to his physical and chemical environment. *Prereq. 12.509.*

AVIATION TECHNOLOGY

1.307 Introduction to Aircraft Design (1 cl., 2 lab., 2 q.h.)

Basic orthographic principles and interpretations of aircraft design. A presentation of basic aerodynamics, structural characteristics of Aircraft, Materials, and Manufacturing Processes. Laboratory work will involve aircraft construction. *Prereq. 10.391 & 11.391.*

1.308 Aircraft Power & Systems (4 cl., 4 q.h.)

Engine types, nomenclature and engine development. Engine cycles and principles, performance, power and its measurement, ratings. Design and construction of parts and their functions. Valve mechanisms and timing. Cooling system, carburation, fuel system ignition system, lubrication and oil system design. Hydraulic, Pneumatic, Electrical and Mechanical systems. Landing gear types, design, loads and limitations. Landing gear retraction systems. General flight control systems including Rudder, elevator, aileron and flaps. Loads and Limitations Deicer systems for flight surfaces, propeller and engine heating systems. Cabin pressure and oxygen systems. Airspeed and general air-driven instrument systems. *Prereq. None.*

1.309 Introduction to Aerodynamics (1 cl., 1 q.h.)

A non-calculus presentation of basic fluid dynamics and principles of fluid flow. Includes continuity, Bernoulli and momentum equations; streamlines, stream tubes, drag, theory of lift, wing theory, vortex flow, ground effect, stalls, boundary layer, flow separation, control surfaces, stability and balance. *Prereq. 1.308 and 11.318 or concurrently.*

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96.310 Basic Helicopter Aerodynamics (2 cl., 2 q.h.)

General aerodynamics, helicopter components and their functions, loads and load factors, gyroscopic procession principle, performance, introduction to flight manual, helicopter operations in confined areas, and precautionary measures and critical conditions. *Prereq.* 96.392.

96.311 Aviation Meteorology I (2 cl., 2 q.h.)

A survey of the principles of meteorology and structure of the atmosphere. Meteorological instruments and observations. *Prereq.* 11.306 or equiv.

96.312 Aviation Meteorology II (2 cl., 2 q.h.)

Weather map interpretation and common aviation weather teletype codes. Physical approach to pressure, temperature, basic thermodynamics, stability, and cloud formations. *Prereq.* 96.311.

96.313 Climatology (2 cl., 2 q.h.)

Climate causes and effects. Climatology of several regions of the world. Application of climatology to problems of airport location and construction, airline operation, and private flying. *Prereq.* 96.312.

96.321 Avionics I (2 cl., 2 q.h.)

Review of basic electronic principles, hazards, aircraft electrical systems, FCC regulations, selection, installation, and service of avionics, strobe lights, radio communications. *Prereq.* 03.309 or 03.395.

96.322 Avionics II (2 cl., 2 q.h.)

Antennas, ADF, omni, localizer, marker beacon, audio systems, transponders. *Prereq.* 96.321.

96.323 Avionics III (2 cl., 2 q.h.)

Glide slope, DME, RNAV, radar, INAV, autopilots. *Prereq.* 96.322.

96.324 Introductory Avionics (4 cl., 4 q.h.)

Basic coverage of electronics including: vacuum tube principles, semiconductor physics principles, power supplies, amplifiers, oscillators, and pulse circuits. Also generator and motor principles and applications. Basic concepts of avionics, electrical hazards, aircraft electrical systems, electrical instruments, strobe lights, FCC regulations, radio communications and antennas. *Prereq.* 11.319.

96.325 Avionics (4 cl., 4 q.h.)

Selection, installation, and servicing of avionics, automatic direction finders, marker beacons, omnirange and localizers, audio switching systems, ATC transponders, glide slope systems, distance measuring equipment, autopilots and radar. *Prereq.* 96.324.

96.326 Avionics Laboratory I (3 lab., 2 q.h.)

Experiments dealing with laboratory techniques in measuring instruments, signal generators, and oscilloscopes. Junction and field effect transistor characteristics. Filter circuits. Q meter, coils with iron cores. Vacuum and semi-conductor diode, power supplies including the regulated type, silicon controlled rectifier transistor amplifiers. *Prereq.* 96.324 and 96.325.

6.327 Avionics Laboratory II (3 lab., 2 q.h.)

Experiments in oscilloscopes, double tuned transformers, audio frequency oscillators, modulation of class C amplifiers, the diode detector, RF and crystal oscillators. Testing of a radio receiver. Reactance modulators, F.M. Detectors. Prereq. 96.326.

6.328 Avionics Laboratory III (3 lab., 2 q.h.)

Experiments in navigation equipment for aircraft. Prereq. 96.327.

96.331 Primary Flight I (2 lab., 1½ q.h.)

Elements of flight principles (pre-flight operations), operation of aircraft systems. Taxi operations and ground performance. Basic flight maneuvers. Take-offs and landings. Prereq. Class I or II, medical certificate.

96.332 Primary Flight II (2 lab., 1½ q.h.)

Review of basic flight maneuvers. Advanced maneuvers and stall procedures. Short field take-offs and landings. Power approaches and landing under varying conditions. Emergency operation of aircraft equipment. Prereq. 96.331. Student must have a current endorsement for solo flight.

96.333 Primary Flight III (2 lab., 1½ q.h.)

Cross country flight planning and flight. Lost procedures and related emergencies. Use of radio and navigation equipment under V.F.R. (visual flight rules). Control of aircraft by reference to flight instruments only. Private license qualifications complete. Prereq. 96.332. Student must have a current endorsement for solo cross country flight.

96.341 Commercial Flight I (2 lab., 1½ q.h.)

Review of all primary flight maneuvers. Advanced maneuvers. Precision take-offs and landings, cross wind techniques. Prereq. 96.333.

96.342 Commercial Flight II (2 lab., 1½ q.h.)

Precision flight maneuvers — spirals about a point. Shallow and steep on pylons, 720° steep power turns. Solo practice. Prereq. 96.341.

96.343 Commercial Flight III (2 lab., 1½ q.h.)

Continuation of precision maneuvers: lazy eights, chandelles, maneuvers at minimal controllable airspeed. Continued related simulator practice. Night flying. Basic instrument flying. Prereq. 96.342.

96.344 Commercial Flight IV (2 lab., 1½ q.h.)

Tails from all normally anticipated flight altitudes with and without power. Simulated emergency procedures and forced landings. Basic instrument flying. Prereq. 96.343.

96.345 Commercial Flight V (2 lab., 1½ q.h.)

Advanced cross country flight planning and navigation. Advanced radio communications and traffic procedures. Review of all maneuvers and procedures. Certification F.A.A.) Prereq. 96.344.

96.351 Instructional Flight I (2 lab., 1½ q.h.)

Fundamentals of flight instruction. Development of student-instructor relationship and rapport. Teaching procedures in flight training. Instructor responsibilities and record maintenance. Instructor flight demonstrations. Qualification and certification by F.A.A. Prereq. 96.345 & 96.354 or concurrently.

***96.352 Instructional Flight II** (2 lab., 1½ q.h.)

Continuation of fundamentals of instruction, flight training procedures, student instructor relationship, review of all maneuvers and flight demonstrations. Certification by F.A.A. Prereq. 96.351.

96.354 Principles of Flight Instruction (2 cl., 2 q.h.)

Fundamentals and principles of instructing, learning concepts of teacher student communications. Use of special flight teaching aids, and training procedures. Prereq. 96.345 or equivalent test.

***96.355 Instrument Instructor Flight A** (2 lab., 2 q.h.)

Fundamentals and procedures for teaching operating limitations of all instruments, control of rate of climb and descent to pre-determine altitudes, procedures for coping with unusual altitudes and critical situations.

***96.356 Instrument Instructor Flight B** (2 lab., 2 q.h.)

Principles and procedures of teaching methods in instrument flight planning and enroute weather analysis, radio communication and enroute navigation and orientation. Oral exam and flight test preparation.

96.357 Multi-Engine Flight (2 lab. 1½ q.h.)

Preparation for a F.A.A. multi-engine rating test which includes an oral exam on the aircraft documents performance, and operating characteristics. Multi engine flight instruction on basic piloting techniques and emergency procedures.

96.358 Helicopter A (2 lab., 2 q.h.)

Elements of flight principles, operations of helicopter systems. Hovering flight Take-off, hover, forward climb, pattern, power-glide approach, transition to hovering, vertical landing. Square patterns. Crosswind take-off and landing Running take-off and landing autorotations. Prereq. Commercial Fixed Wing License. Class I or II medical certificate.

96.359 Helicopter B (2 labs., 2 q.h.)

Review and practice take-offs, landings, all maneuvers plus settling with power and recovery, quick stops, precision pattern and landing. Solo practice. Dual review for FAA Flight Test. Prereq. Helicopter A 96.358.

96.360 Aircraft Analysis I (2 cl., 2 q.h.)

A presentation of subsonic aerodynamics and structural characteristics of aircraft. Prereq. 11.317.

***96.361 Instrument Flight I** (2 lab., 1½ q.h.)

Instrument flight planning, preparing and filing. Aircraft performance (range and fuel requirements). Required instruments and their proper use. Basic instrument flying, needle ball and airspeed only. Instrument use in turns, climbs, descents, stalls and approach speeds. Recovery from unusual altitudes. Airwork using all altitudes instruments. Prereq. 96.345.

*See Flight Tuition Schedule, pages 47 and 48.

96.362 Instrument Flight II (2 lab., 1½ q.h.)

radio navigation while flying on instruments. Use of L.F. (low frequency), omni-range, or A.D.F. (automatic direction finder). Advanced radio communications. Instrument approaches, holding procedures, missed approach procedures, emergencies (radio and instrument malfunctions). Air traffic control instructions and procedure. Rating by F.A.A. Prereq. 96.361.

5.370 Air Cargo Practices A (3 cl., 3 q.h.)

Study of airline and air freight forward cargo practices with emphasis on regulation, economics, marketing, and handling and organizational aspects.

5.371 Air Cargo Practices B (3 cl., 3 q.h.)

continuation through case studies of air cargo operations.

5.372 Airline Traffic and Sales A (3 cl., 3 q.h.)

functions of the traffic & sales department, relationship between the travel agencies and the airlines, relationships with other carriers, reservations and the procedures involved in the transportation of one passenger of NCA and another carrier, airlines promotion, the reservation agent and training.

5.373 Airline Traffic and Sales B (3 cl., 3 q.h.)

Schedules and frequencies with an explanation of how flight times are established, flight frequencies, new routes, and the establishment of ticket fares. Aspects of cargo and charters.

5.376 General Aviation Operations A (3 cl., 3 q.h.)

Presentation of the major functions of airport management; organization, planning, adequacy, financing, revenues and expenses, evaluation and safety. A study of the airport and its socioeconomic effect on the community. Prereq. none.

5.377 General Aviation Operations B (3 cl., 3 q.h.)

continuation through case studies of General Aviation Operations. Prereq. 5.376.

5.378 Air Traffic Control Systems A (3 cl., 3 q.h.)

Survey of the total aero-space system and management. Air traffic administrative coordination. Regional responsibilities. NAFEC organization of center, tower, and station.

5.383 Advanced Aircraft Analysis (2 cl., 2 q.h.)

Presentation of supersonic aerodynamics and structural characteristics of aircraft. Prereq. 11.318.

5.384 Aviation History (3 cl., 3 q.h.)

Historical survey of efforts in manned flight, aircraft development, pioneers in flight, general aviation, military and commercial aspects of flight and effects on modern civilization. Prereq. none.

96.390 Pilot Refresher (2 lab., 1½ q.h.)

This course consists of 24 hours of concentrated instruction and evaluation of pilot proficiency in advanced instrument flying and instructional flight procedures. It involves simulator flight, aircraft flight, ground instruction and the updating of current procedures in flight instruction and flight planning procedures. Prereq. special permission of flight director.

96.391 Air Science & Navigation A (3 cl., 3 q.h.)

Aircraft structures and components aerodynamic forces, airfoil terminology – lift, and drag coefficient, boundary layer problems and control, Reynolds Number and Scale Effect. Earth in space, latitude, longitude, properties and components of the atmosphere, map projections, dead reckoning, reciprocating engine theory, gas turbine engine theory, planform effects, aircraft weight and balance.

96.392 Air Science & Navigation B (3 cl., 3 q.h.)

Radio navigation, VOR, ADF, DME and TACAN, federal air regulations, airplane performance (climb, range, altitude, takeoff, and landing), aircraft propeller theory and operation, specific aircraft substructures (landing gear et. al.) advanced DR navigation problems (radius of action, unknown wind), general review. *Prereq. 96.391.*

96.393 Advanced Air Science & Navigation A (3 cl., 3 q.h.)

Supersonic aerodynamics physiologic factors of flight, instrument flight charts IFR planning, instrument flight rules, static and dynamic axial stability of aircraft, control movements and forces, stability problems. *Prereq. 96.392.*

96.394 Advanced Air Science and Navigation B (3 cl., 3 q.h.)

Spins and spin recoveries, flying high performance aircraft, area charts, arrival and departure, SID charts, clearance notation, aircraft performance, applications of aerodynamics to specific problems of flight, helicopter stability, structural strength limitations, doppler radar, precision approach radar & airport surveillance radar, loran, consolan, pressure pattern flight. *Prereq. 96.393.*

96.395 Meteorology & Climatology A (3 cl., 3 q.h.)

A survey of the principles of meteorology and structure of the atmosphere. Meteorological instruments and observations. Weather map interpretation and common aviation weather teletype codes. *Prereq. 11.392.*

96.396 Meteorology & Climatology B (3 cl., 3 q.h.)

Physical approach to pressure, temperature, basic thermodynamics, stability and cloud formations. Climate causes and effects. Climatology of several regions of the world. Application of climatology to problems of airport location and construction, airline operation, and private flying. *Prereq. 96.395.*

96.399 Flight Physiology (2 cl., 2 q.h.)

The study of the physical and chemical processes of the body. Functions of the living body and its environment. Adaptive changes of function of the body resulting from a change in environment with emphasis on flight. The effects of medication on the function and reactions of the body with emphasis on flight. The effects of the state of the mind on the function and reactions of the body with emphasis on flight.

96.401 Aircraft Engines I (2 cl., 2 q.h.)

Engine types, nomenclature and engine development. Engine cycles and principles, performance, power and its measurement, ratings. Design and construction of parts and their functions. Valve mechanisms and timing. Cooling system, carburetion, fuel system, ignition system, lubrication and oil system design.

6.402 Aircraft Engines II (2 cl., 2 q.h.)

presentation of turbo-engine types and their development. Radial flow and axial flow types, turbo-prop, compounding, ram jets, pulse jets and rockets. Principles of combustion and propulsion, performance, power, thrust and their measurement, design and construction. Fuel, lubrication, and ignition systems.

6.425 Chronology of Aviation I (2 cl., 2 q.h.)

1903-1939; early flights 1903-1914 era, World War I 1914-1918 era, airmail and barnstorming era, famous pilots and company histories traced 1920-1939 including history of air racing. *Prereq. none.*

6.426 Chronology of Aviation II (2 cl., 2 q.h.)

1939-present; World War II 1939-1945 era, all personalities and company histories traced, post World War II up to Apollo 17, final flight in Apollo program. *Prereq. none.*

6.430 Aviation Preventive Maintenance (2 cl., 2 q.h.)

For pilots and aircraft owners. Airframe and powerplant nomenclature, structures, and systems. Maintenance that a pilot can and is allowed to do to the frame and engine of his aircraft, proper techniques. *Prereq. none.*

6.431 Aircraft Systems (2 cl., 2 q.h.)

Hdraulic, Pneumatic, Electrical and Mechanical systems. Landing gear types, sign, loads and limitations. Landing gear retraction systems. General flight control systems including Rudder, elevator, aileron and flaps. Loads and limitations, Deicer systems for flight surfaces, propeller and engine breathing systems. Cabin pressure and oxygen systems. Airspeed and general air-driven instrument systems. *Prereq. None.*

6.432 Aircraft Laboratory (2 lab., 1 q.h.)

Aircraft construction methods and techniques will be applied to the construction of aircraft components.

NEW GENERAL INTEREST COURSES

In response to repeated requests, we are offering several new courses in technology which do not require students to have a mathematical background. These courses have a three fold purpose: First, we would like to encourage general arts and business students to get interested in technology. Second, we hope that new students without mathematical backgrounds will be sufficiently attracted to science and technology that they will ultimately undertake our regular curricula. Lastly, these courses should serve to clarify the complexities of our technological world for anyone who chooses to undertake them.

.401 Technology of Modern Architecture I (2 cl., 2 q.h.)

This course covers the general background of architectural styles both historical and contemporary with emphasis on the engineering design aspects and construction procedures concerned with the various types of buildings involved. *Prereq. none.*

.402 Technology of Modern Architecture II (2 cl., 2 q.h.)

This course covers contemporary architecture and concerns itself with an emphasis on the engineering design aspects and construction procedures required for modern buildings. *Prereq. none.*

02.401 Man and Materials (2 cl., 2 q.h.)

The consumption of earth's raw materials has increased drastically creating serious ecological problems. Metals, plastics, ceramics, concrete, etc. all evolve from substances in the earth's crust, unfortunately however, they are not properly recycled because costs have always come before environment. This course will explore what action man may take now to prevent chaos in the future. *Prereq. none.*

03.401 Electric Devices and Systems I (2 cl., 2 q.h.)

A non-mathematical examination of electric and electronic devices which have become a part of daily living. An analysis of functional demands and their realization in elementary working systems. Ratings and applications of devices including light, heat, and mechanical energy convertors. *Prereq. none.*

03.402 Electric Devices and Systems II (2 cl., 4 q.h.)

A continuation of 03.401, discussion of modern communications systems, radio, TV, telephone. Economic trade-off in designs; energy sources and energy conversion, transmission systems. Rate basis implications of increased load base. Atomic vs. fossil fuels. *Prereq. 03.401.*

09.401 Interpretation of Industrial Drawings (2 cl., 2 q.h.)

Emphasis on the understanding of the concepts conveyed by working engineering drawings. Practice is provided in reading and interpreting the standard conventions and symbols used to transmit the designer's ideas to the tradesman or craftsman. No formal drafting will be done, although a few free hand sketches will be encouraged. *Prereq. none.*

10.401 Foundations of Mathematics I (2 cl., 2 q.h.)

The many branches of mathematics. Origins of arithmetic and algebra, and their place in early societies. *Prereq. none.*

10.402 Foundations of Mathematics II (2 cl., 2 q.h.)

Mathematics and the scientific revolution. Functions, graphs, concepts of the calculus. *Prereq. 10.401.*

10.403 Foundations of Mathematics III (2 cl., 2 q.h.)

Mathematics today: analysis, probability, statistics, and other topics. The mutual dependence of mathematics and computers. Math in social sciences, physical sciences, and business. *Prereq. 10.402.*

11.401 Man's Physical Environment I (2 cl., 2 q.h.)

The nature of energy. Its sources and the economics of its expenditure. The harmonious interactions of natural physical systems and the conservations which govern them. Man's exploitations of these laws. The cyclic nature of useful physical processes; reversible and irreversible. *Prereq. none.*

11.402 Man's Physical Environment II (2 cl., 2 q.h.)

The methods by which man gains knowledge of two inscrutable areas of his environment. Effects of scale from astro-physical to atom. The paradoxical implications of this knowledge and its effect on man's dealings with his environment. *Prereq. none.*

LINCOLN COLLEGE ENGINEERING TECHNOLOGY**EVENING COURSES LISTED WITH EQUIVALENT DAY BET COURSES**

Evening Courses		Day BET Courses	
02.301, 02.302	Mechanics (Statics) I, II	02.411	Mechanics A
02.303, 02.304	Mechanics (Statics) III, Mechanics (Dynamics) I	02.412	Mechanics B
02.305, 02.306	Mechanics (Dynamics) II, III	02.413	Mechanics C
02.321, 02.322	Stress Analysis I, II	02.414	Stress Analysis A
02.323, 02.324	Stress Analysis III, Adv. Stress Analysis I	02.415	Stress Analysis B
02.325, 02.326	Advanced Stress Analysis II, III	02.416	Stress Analysis C
02.327, 02.328	Mechanical Design, I, II	02.417	Mechanical Design A
02.329	Mechanical Design III	02.418	Mechanical Design B
02.351, 02.352	Thermodynamics I, II	02.421	Thermodynamics A
02.353, 02.357	Thermodynamics III, Heat Engineering (Refrigeration) I	02.422	Thermodynamics B
2.358, 02.359	Heat Engineering II, III	02.423	Thermodynamics C
02.354	Heat transfer	02.414	Thermodynamics D
2.355, 02.356	Heat Transfer II, III	02.425	Thermodynamics E
2.341, 02.342	Materials I, II	02.431	Materials A
2.343, 02.344	Materials III, Applied Metallurgy I	02.432	Materials B
2.345, 02.346	Applied Metallurgy II, III	02.433	Applied Metallurgy
1.341, 01.342	Fluid Mechanics I, II	02.441	Fluid Mechanics A
01.343	Fluid Mechanics III	02.442	Fluid Mechanics B
2.337, 02.338	Mechanical Vibrations I, II	02.451	Mechanical Vibrations
2.334, 02.335	Exp. Stress Analysis I, II	02.452	Experimental Stress Analysis
02.331	Mechanical Technology Laboratory I	02.462	Mechanical Technology Laboratory I
02.332	Mechanical Technology Laboratory II	02.463	Mechanical Technology Laboratory II
02.333	Mechanical Technology Laboratory III	02.464	Mechanical Technology Laboratory III
02.361	Heat Technology Laboratory I	02.465	Heat Technology Laboratory I
02.362	Heat Technology Laboratory II	02.466	Heat Technology Laboratory II

Evening Courses		Day BET Courses
03.306	Electrical Measurements (Plus 2 q.h.)	03.410 Electrical Measurements
03.320, 03.321	Electricity & Electronics I, II	03.420 Electricity & Electronics I
03.322	Electricity & Electronics (Plus 2 q.h.)	03.421 Electricity & Electronics II
11.322, 11.323	Semiconductor Physics I, II	03.440 Physical Electronics
03.331, 03.333	Energy Conversion I, III	03.430 Energy Conversion
03.301, 03.302	Circuit Theory I, II	03.451 Circuit Analysis I
03.303, 03.304	Circuit Theory III, IV	03.452 Circuit Analysis II
03.361, 03.362	Transients in Linear Systems I, II	03.453 Circuit Analysis III
03.363	Transients in Linear Systems (Plus 2 q.h.)	03.354 Circuit Analysis IV
10.324, 10.325	Differential Equations I, II	03.460 Engineering Analysis I
03.391, 03.392	Computer Technology Laboratory I, II	03.470 Digital Computers
03.377, 03.378	Control Systems I, II	03.477 Control Engineering I
03.379	Control Systems III (Plus 2 q.h.)	03.478 Control Engineering II
03.397, 03.398	Optical Instrumentation I, II	03.490 Optical Instrumentation
04.381, 04.383	Nuclear Technology I, III	04.481 Nuclear Technology
09.351	Principles of Computer Programming I	09.421 Principles of Computer Prog. I
09.352	Principles of Computer Programming II	09.422 Principles of Computer Prog. II
09.353	Principles of Computer Programming III	09.423 Principles of Computer Prog. III
09.311	Engineering Graphics I	09.461 Engineering Design Graphics I
09.312	Engineering Graphics II	09.462 Engineering Design Graphics II
09.313	Engineering Graphics III	09.463 Engineering Design Graphics III
09.307	Electrical & Electronic Graphics I	09.461 Engineering Design Graphics I
09.308	Electrical & Electronic Graphics II	09.462 Engineering Design Graphics II
09.309	Electrical & Electronic Graphics III	09.463 Engineering Design Graphics III

Evening Courses	Day BET Courses
09.314, 09.315 Engineering Design I, Engineering Design II	09.464 Engineering Design Graphics IV
10.307 College Algebra & Trig. I	10.307 College Algebra & Trig. I
10.308 College Algebra & Trig. II	10.308 College Algebra & Trig. II
10.320 Calculus I	10.320 Calculus I
10.321, 10.322 Calculus II, III	10.421 Calculus A
10.323, 10.324 Calculus IV, Differential Equations I	10.422 Calculus B
10.325, 10.326 Differential Equations II, III	10.423 Differential Equations
11.317 Physics I	11.317 Physics I
11.318 Physics II	11.318 Physics II
11.319 Physics III	11.319 Physics III
11.373 Physics Lab. I	11.373 Physics Laboratory I
11.374 Physics Lab. II	11.374 Physics Laboratory II

the lincoln college faculty

THE STRENGTH of an educational institution lies in the quality of its faculty. This is especially true in a college devoted to the training of mature men and women, many of whom are already employed in their chosen professions.

The instructional staff of Lincoln College is composed of professional academicians from Northeastern University and neighboring educational institutions and practicing professionals from the scientific and industrial community of Greater Boston. The theoretical training and practical experience represented by this combination of specialists is ideally suited to the technology programs they teach and the adult students they serve.

The faculty are selected for their ability and active interest in the welfare of ambitious part-time students. They are men and women of culture and high ideals and are qualified by educational training and professional experience to teach effectively in their respective fields.

A staff of experienced professional educators who serve as program and course consultants, constitutes the Academic Advisory Council and Curriculum Advisory Committee of the College. They guide, supervise, and assist with the administration of courses and programs.

THE FACULTY

The following is an alphabetical list of the faculty of Lincoln College; degrees earned (year of appointment), professional affiliation, titles and Lincoln College department are listed.

Charles D. Aaronson, B.S., M.S.

Electrical Engineering Manager for McPherson Instr. Corp.

Electrical Engineering Technology (1964)

Sherif M. Abdel-Moneim, B.S., M.S.

Teaching Assistant, Electrical Engineering, Northeastern University.

Electrical Engineering Technology (1973)

Arnold W. Almquist, Jr., B.S., M.Ed.

Instructor of Mathematics, Needham High School.

Mathematics (1967)

George H. Anderson, Commercial Art Diploma

Professional Artist; Free Lance Technical Illustrator.

Engineering Graphics and Computation (1956)

Will C. Anderson, B.S., M.S.

Programming Engineer, Raytheon Corporation.

Engineering Graphics and Computation (1968)

*Robert B. Angus, Jr., B.S., M.S., P.E. (Mass.)

Manager of Field Development, Technical Education Research Centers.

Electrical Engineering Technology (1948)

Victor S. Aramati, M.S., B.S.

Bell Telephone Laboratories

Mechanical Engineering Technology (1970)

Nathon Aron

Engineer, Raytheon Inc.

Electrical Engineering (1973)

Louis E. Ashley, A.B., M.Ed.

Product Development Section, Arthur D. Little, Inc.

Mechanical Engineering Technology (1966)

*Robert J. Averill, B.S., M.S.

Cambridge Electron Accelerator, Harvard University.

Course Consultant for Electrical Engineering Technology (1957)

*Russell H. Babcock, S.B., S.M., P.E. (Mass., Maine, N.H., R.I., Vt., Conn.)

Diplomate, American Academy of Environmental Engineers;

Chief Water Resources Engineer, C. E. Maguire, Inc.

Civil Engineering Technology (1954)

John C. Balsavich

Laboratory Supervisor, Electrical Engineering, Northeastern University.

Electrical Engineering Technology (1957)

Westley P. Barry, BBA, Eng. & Mgt.

McBar Associates.

Electrical Engineering Technology (1971)

Samuel W. Bartol, B.A.

CFI Multiengine & Instrument Ratings, Wiggins Airways.

Aviation (1969)

*Appointed to the rank of Senior Lecturer

Adolph Baumann, B.S., P.E. (Mass.)
Lecturer, Electronics Engineering, Northeastern University.
Electrical Engineering Technology (1955)

Fred E. Bellows, Jr., B.S., M.Ed.
Principal, East Elementary School, Sharon.
Aviation Technology (1968)

Walter E. Benulis, B.S., M.S.
Research Associate, M.E. Department, Northeastern University.
Mechanical Engineering Technology (1969)

Matteo P. Berardi, B.S., M.S.
Supervisor, Materials Technology.
Mechanical Engineering Technology (1960)

Maureen P. Berggren, B.S.
Mathematics (1965)

Alfred L. Birch, B.S.E.E., P.E. (Mass.)
Dept. Head, Development Engineering, Western Electric Co.
Electrical Engineering Technology (1965)

Emmanuel E. Bliamptis, B.S., S.M., M.A., P.E. (Mass.)
Research Physicist, Air Force Cambridge Research Labs.
Physics (1965)

Joseph I. Bluhm, S.B., M.S., P.E. (Mass., Ohio)
Chief Mechanics Research Laboratory,
Army Materials and Mechanics Research Center.
Mechanical Engineering Technology (1966)

Sidney Bluhm, A.B., Ed.M., A.M.
Head, Science Department, Boston Technical High School (Retired).
Physics (1965)

Edward Bobroff, B.M.E., P.E. (Mass.)
Chief Engineer, Combat Systems, Boston Naval Shipyard.
Course Consultant for Mathematics (1946)

Edward J. Booth, A.B., Ed.M.
Associate Professor of Mathematics, Northeastern University.
Mathematics (1956)

Roland J. Boucher, B.A., M.S.
Research Physicist, Air Force Cambridge Research Lab.
Aviation Technology (1968)

James W. Bougioukas, B.S., P.E. (Mass.)
Principal Civil Engineer Mass. D.P.W..
Engineering (1971)

Kenneth E. Bourque, B.S., M.S.
Gauthier Imported Cars.
Electrical Engineering Technology (1959)

Alan Bradshaw, B.S., M.S.
Chelmsford School System.
Mathematics (1966)

Eugene G. Branca, S.B., S.M.
Assistant Headmaster (Retired), Hyde Park High School.
Mathematics (1946)

Donald H. Breslow, S.B., M.S.
Director of Engineering, Measurement Systems Division, Itek Corp.
Electrical Engineering Technology (1959)

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Alfred E. Bresnahan, B.S., M.A.
Chairman, Mathematics Dept., Lynn English High School.
Mathematics (1967)

Donald C. Brock, B.S., M.S.
Mathematics Instructor, Needham High School.
Mathematics (1965)

Bruno Brodfeld, B.S.C.E. (Mass., La.)
P.E. Chief Environmental Engineer, Stone & Webster Engineering Corporation.
Civil Engineering Technology (1965)

*Franklyn K. Brown, B.S.Ed., M.Ed.
Associate Professor, Graphic Science, Northeastern University.
Course Consultant for Engineering Graphics and Computation (1955)

William A. Brown, B.S.E.E., M.S.E.E., J.D.
Assistant Professor of Law, Suffolk University Law School.
Electrical Engineering Technology (1965)

Jeffrey L. Bruce, B.S., M.A.
Instructor, Dover-Sherborn Regional High School.
Mathematics (1969)

William O. Bruehl, B.S.
Associate Professor, Mechanical Engineering, Northeastern University (Retired).
Course Consultant for Mechanical Engineering Technology (1956)

*Morris H. Burakoff, B.S., P.E. (Mass.)
Department Chief, Western Electric Company.
Electrical Engineering Technology (1957)

George Burdick, A.B., P.E. (Mass.)
Hudson Institute, Hudson, Mass.
Electrical Engineering Technology (1950)

Ralph A. Buonopane, B.S., M.S., Ph.D.
Associate Professor of Chemical Engineering, Northeastern University.
Chemical Engineering Technology (1964)

Donald Burgess, A.B., M.Ed.
Head of Department, Boston English High School.
Mathematics (1967)

Steven Butcher, Jr., S.B., M.S.
Technical Staff, The Mitre Corporation.
Electrical Engineering Technology (1967)

Gregory J. Cahill
Engineer, Jackson Moreland
Mechanical Engineering Technology (1968)

*Leroy M. Cahoon, B.S.C.E., M.S., P.E. (Mass.)
Associate Professor of Civil Engineering, Northeastern University.
Program Consultant for Civil Engineering Technology (1962)

John J. Callahan, B.S., M.Ed., M.A.
Assistant Professor, Boston State College.
Mathematics (1969)

*Frank R. Cangiano, B.S., Ed.M.
Instructor in Science and Mathematics, Medford High School.
Mathematics (1957)

*Appointed to the rank of Senior Lecturer

Barry S. Canner
Wiggins Airways
Aviation Technology (1970)

Edgar T. Canty, B.S., M.S.
Director Academic Computing Services.
Mathematics (1966) Babson College

Richard I. Carter, B.S., M.S., P.E. (Mass.)
Associate Professor, Electrical Engineering and Director of Computation Center,
Northeastern University.
Engineering Graphics and Computation (1955)

Walter J. Casey, A.B., M.Ed., M.A.T.
Head of Department, Brighton High School.
Mathematics (1955)

Walter J. Charow, B.S.E.E., M.S.E.E., P.E. (Mass.)
Branch Chief, Avionics, Electronics System Div., U.S.A.F.
Electrical Engineering Technology (1955)

Bruce B. Clafflin, A.B., M.S.
Associate Professor of Mathematics, Northeastern University.
Course Consultant for Mathematics (1964)

Philip J. Clang, B.S., P.E. (Conn., Mass., Pa.)
Project Manager, United Engineers & Constructors, Inc.
Mechanical Engineering Technology (1957)

John J. Cochrane, B.S., M.S., Ph.D., P.E. (Mass.)
Associate Professor of Civil Engineering, Northeastern University.
Civil Engineering Technology (1972)

Matthew H. Cohn, B.S.
Senior Engineer, Group Leader, Raytheon Company.
Engineering Graphics and Computation (1969)

Leonard M. Conlin, A.B., Ed.M.
Mathematics Teacher, Framingham North High School.
Mathematics (1967)

Joseph V. Connolly, B.S., M.Ed.
Head of Department, Boston Latin School.
Physics (1965)

Roger T. Connor, A.B., M.Ed.
Principal — Milton High School.
Mathematics (1953)

Robert J. Connors, B.S.
Manager of Technology, Electronic Systems, Sylvania Electric Products, Inc.
Electrical Engineering Technology (1948)

Edward M. Cook, A.B., A.M.
Professor of Mathematics, Northeastern University.
Program Consultant for Mathematics (1941)

Joseph Z. Cooper, B.S.E.
Principal Engineer, Raytheon Company.
Engineering Graphics and Computation (1967)

Robert C. Copeland, B.S.E.E., S.M.
WCVB-TV, Chief Meteorologist.
Aviation Technology (1968)

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James B. Corscadden, B.S., M.Ed., A.M.T.
Head of Department, South Boston High School.
Mathematics (1967)

Richard E. Cox, B.S.M.E., M.S., P.E. (Mass.)
Professional Engineer, Technical Operations.
Mechanical Engineering Technology (1967)

David C. Crockett, B.S., M.S.
Consultant
Mechanical Engineering Technology (1969)

Thomas J. Crowley, S.B., M.S., P.E. (Mass.)
Research Associate, Harvard University School of Public Health.
Mechanical Engineering Technology (1966)

Mukti Lal Das, B.S., M.S., Ph.D., P.E. (Mass.)
Structural Engineer, Stone and Webster Corporation.
Civil Engineering Technology (1972)

*Herbert R. Davenport, B.S.
Standards Engineer, General Radio Company.
Electrical Engineering Technology (1948)

Warren C. Dean, A.B., M.A.
Associate Professor of Mathematics, Northeastern University.
Course Consultant for Mathematics (1941)

Dean A. De Marre, A.E., B.S., Sc.D.
Consulting Editor, Medical Electronics & Data
President CTR, Inc., Adjunct Professor at Indiana Northern University.
Electrical (1967)

Thomas R. Deveney, B.S.
Curriculum Design Specialist, Copley Sq. High School.
Mathematics (1965)

Giles C. Dilg, B.S.E.E., M.S.E.E., P.E. (Mass.)
Senior Project Engineer, Raytheon Corp.
Engineering Graphics & Computation (1966)

Marie Dolansky, B.S., Ed.M., Ed.D., C.G.A.
Mathematics 1964

Mark Domaszewicz, B.E.E., M.S.E.E.
Senior Engineer, Raytheon Company.
Electrical Engineering Technology

Paul I. Douglas, B.S., M.S.
Teaching Assistant, Mechanical Engineering, Northeastern University.
Mechanical Engineering Technology (1973)

Leonard F. Dow, B.S.E.E., M.S., P.E. (Mass.)
Boston Edison Company, Staff Engineer.
Electrical Engineering Technology (1970)

Paul Crowther Dow, Jr., B.S., M.S.E., Ph.D.
Engineering Management, Avco Corporation.
Electrical Engineering Technology (1973)

*Appointed to the rank of Senior Lecturer

- Paul A. Dunkerley, B.S., S.M., P.E. (Mass.)
Associate Professor of Civil Engineering, Tufts University.
Civil Engineering Technology (1968)
- Philip W. Dunphy, B.Sc., M.Ed.
Associate Professor of Cooperative Education, Northeastern University.
Academic Counsellor (1967)
- William V. Durante, B.S., M.Ed., M.A.
Head of Mathematics Dept., Boston Latin School.
Mathematics (1964)
- John A. Ebacher, B.S., M.S.
Engineer, General Electric Co.
Mechanical Engineering Technology (1967)
- Charles P. Englehardt, B.S., M. Arch.
Architect, Corp. of Engineers.
Engineering Graphics & Computation (1942)
- Adolf J. Erikson, B.B.A., M.B.A., P.E. (Mass.)
President, A.E. Engineering Corporation.
Engineering Graphics and Computation (1966)
- Martin J. Feeney, S.B., Ed.M.
Principal Emeritus, Boston Public Schools.
Mathematics (1957)
- Warren G. Ferzoco, A.E., B.B.A., M.Ed.
Dean, Cambridge High and Latin School.
Engineering Graphics and Computation (1966)
- Charles Field, B.S., M.Ed.
Professor of Cooperative Education, Northeastern University.
Academic Counsellor (1967)
- Robert G. Field, S.B.E.E., M.B.A.
Electrical Engineering (1972)
- William D. Finan, A.B., M.A., D.Ed.
Reading Director, Needham Public Schools.
Course Consultant for Mathematics (1946)
- Paul M. Fitzgerald, B.S.
Special Hazards Engineer, Factory Mutual Research.
Fire Technology (1973)
- Louis A. Fiore, A.E., B.B.A.
Mech. Engineer, Design Checker, American Science and Engineering, Inc.
Engineering Graphics and Computation (1956)
- A. Ralph Fiore, Jr., B.S.E.E., M.S. Eng. Mgt., P.E. (Mass.)
Computation & Graphics (1969)
- Robert F. Ford, B.S.E.E., M.S.E.E.
Engineering Manager, Special Systems, Data General.
Electrical Engineering (1962)
- Earlwood T. Fortini, A.B., P.E. (Mass.)
Manager Graphic Products Development, Compugraphic Corp.
Mechanical Engineering Technology (1957)
- Robert M. Fox, A.S., B.S., M.B.A.
Gerber Electronics.
Mathematics 1969
- John L. Freedman, B.S., P.E. (Mass.)
Instructor, Bryant & Stratton and Northeastern University.
Course Consultant for Electrical Engineering Technology (1949)

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Jerry M. Galatis, B.S. (2), M.Ed., O.D.
Physics (1965)

Maurice Gertel
President, Kinetic Systems, Inc.
Mechanical Engineering Technology (1973)

Peter D. Gianino, B.S., M.S.
Research Physicist, Air Force Cambridge Research Labs.
Mathematics (1965)

Charles J. Glassbrenner, B.S., M.S., Ph.D.
Professor, Worcester State College.
Physics (1967)

Sheldon L. Glickler, B.S., M.S.
Avco Everett Research Laboratory, Senior Scientist.
Civil Engineering Technology (1969)

Fredrick M. Glock
Laboratory Assistant, Northeastern University.
Mechanical Engineering Technology (1969)

William B. Goggins, Jr., B.S., M.S.E.E., Ph.D.
Control Systems Engineering (1964)

David Goldberg, B.S., M.S.E.E., M.S.E.M.
Research & Development Engineer, GTE Sylvania.
Engineering Graphics and Computation (1969)

Leonard M. Goodman, S.B., S.M., E.E., P.E. (Mass.)
Staff Member, Lincoln Laboratory, Mass. Institute of Technology.
Electrical Engineering Technology (1969)

Ernest C. Greer, B.S.M.E., M.S.M.E.
Mechanical Engineering Technology (1970)

*Richard Grojean, B.S., M.S. (Physics)
Associate Professor, Electrical Engineering, Northeastern University.
Electrical Engineering (1955)

Forest W. Grumney, B.A., M.B.A.
N.E.G.E.A. Service Corp.
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Civil Engineering Technology (1950)

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Physics (1967)

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Mathematics (1965)

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Electrical Engineering Technology (1963)

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Civil Engineering Technology (1963)

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Civil Engineering Technology (1959)

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Aviation Technology (1969)

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Mathematics (1957)

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Course Consultant for Materials

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Electrical Engineering Technology (1957)

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Mechanical Engineering Technology (1955)

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Civil Engineering Technology (1964)

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Electrical Engineering Technology (1950)

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Mechanical Engineering Technology (1966)

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Electrical Engineering Technology (1945)

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Engineering Graphics and Computation (1936)

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Program Consultant for Engineering Graphics and Computation (1955)

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Mechanical and Electrical Engineering Senior Designer, Aircraft Gas Turbine Division
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Mathematics 1965

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Mathematics (1968)

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Mechanical Engineering Technology (1973)

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Physics (1967)

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Civil Engineering (1972)

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Physics (1966)

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Mechanical Engineering Technology (1946)

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Electrical Engineering Technology (1952)

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Electrical Engineering Technology (1968)

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Electrical Engineering Technology (1950)

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Mechanical Engineering Technology (1960)

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Electrical Engineering Technology (1973)

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Physics (1967)

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Electrical Engineering Technology (1951)

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Civil Engineering Technology (1960)

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Course Consultant for Engineering Graphics and Computation (1966)

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Mechanical Engineering Technology (1959)

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Day and Evening Programs (1947)

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Mathematics (1971)

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Civil Engineering Technology (1972)

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Civil Engineering Technology (1972)

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Associate Professor, Electrical Engineering, Northeastern University.

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Day and Evening Programs (1973)

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Graphics & Computation (1967)

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Mathematics (1946)

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Mechanical Engineering Technology (1961)

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Mathematics (1967)

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Civil Engineering Technology (1970)

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Mathematics (1952)

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Mechanical Engineering Technology (1963)

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Electrical Engineering Technology (1952)

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Physics (1968)

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Mathematics (1967)

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Mechanical Engineering Technology (1966)

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Electrical Engineering Technology (1970)

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Mathematics (1967)

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Electrical Engineering Technology (1960)

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Electrical Engineering Technology (1954)

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Mechanical Engineering Technology (1956)

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Mathematics (1967)

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Physics (1967)

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Mathematics (1959)

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Mathematics (1958)

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Mathematics (1965)

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Physics (1958)

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Electrical Engineering Technology (1967)

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Engineering Graphics and Computation (1967)

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Mathematics (1966)

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Mathematics (1968)

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Mathematics (1967)

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Mechanical Engineering Technology (1955)

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Physics (1967)

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Physics (1961)

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Physics (1968)

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Mathematics (1966)

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Physics (1960)

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Physics (1968)
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Civil Engineering Technology (1949)
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Physics (1961)
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Mathematics (1967)

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Will you please arrange for me to have an interview to discuss
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I would like to apply for advance standing credit and shall arrange
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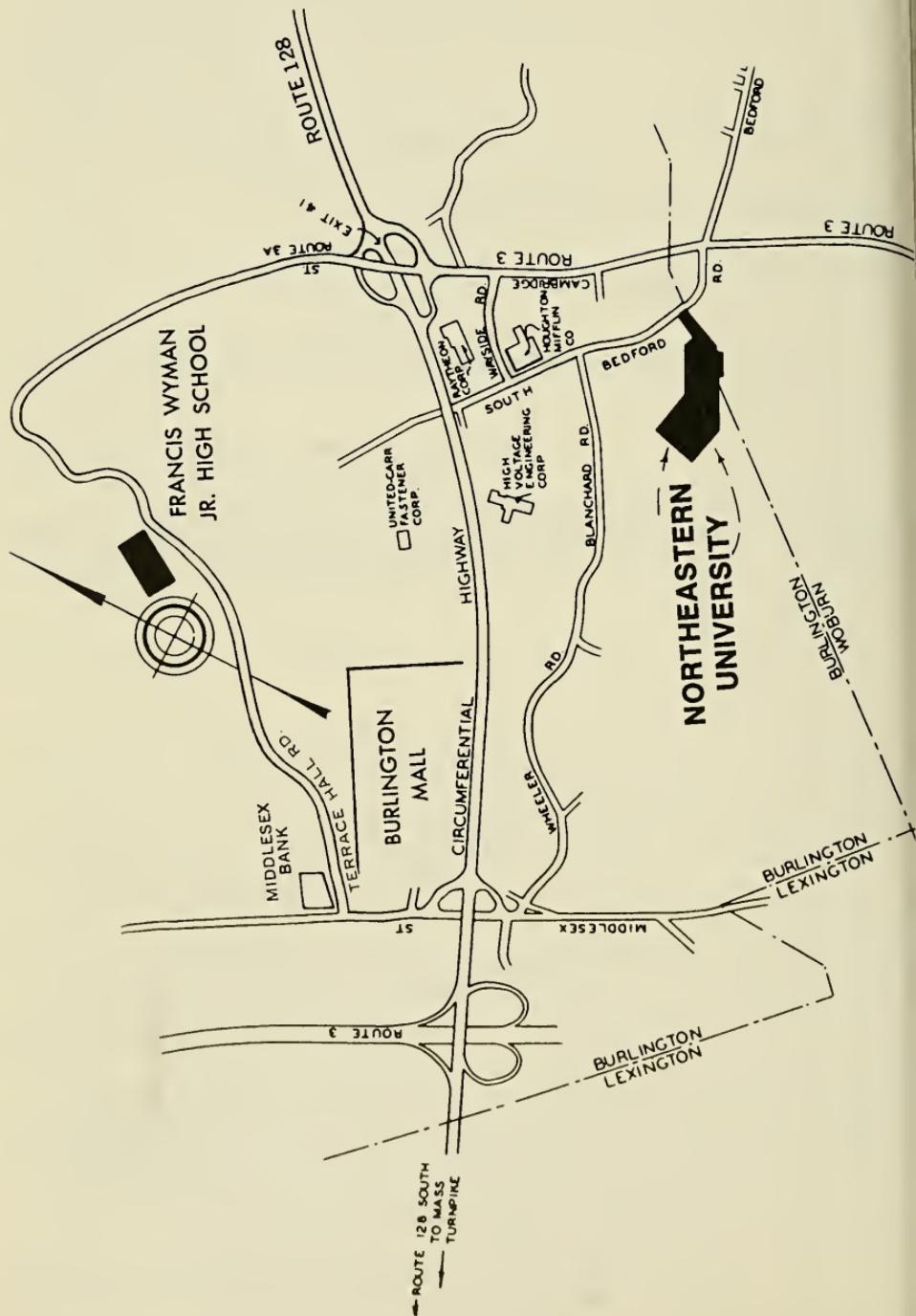
City

State

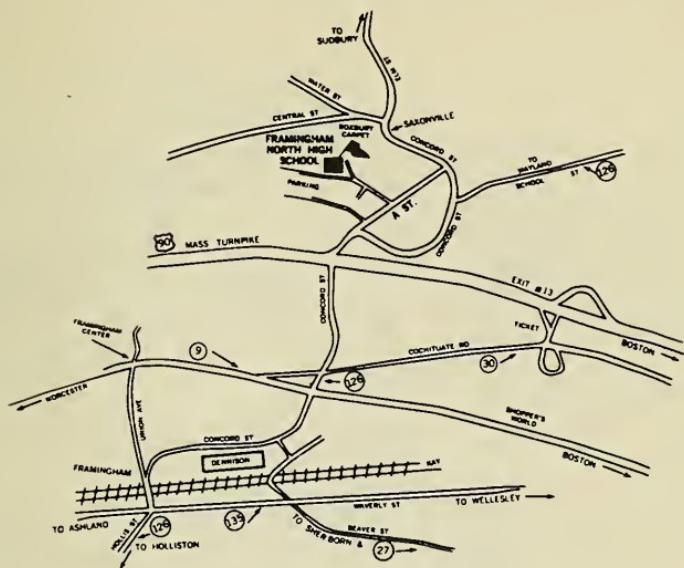
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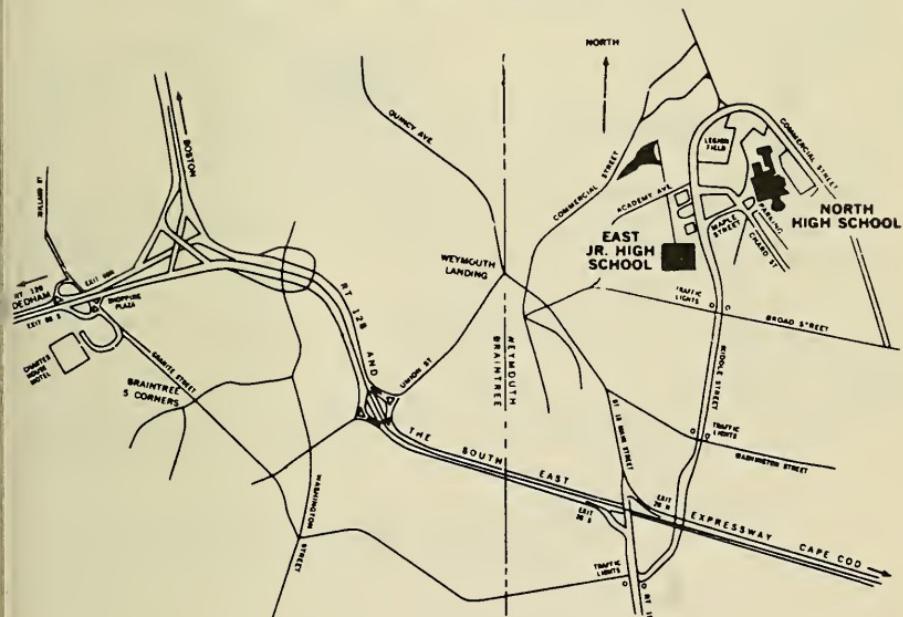
Suburban Campus



Framingham North High School



Weymouth Schools



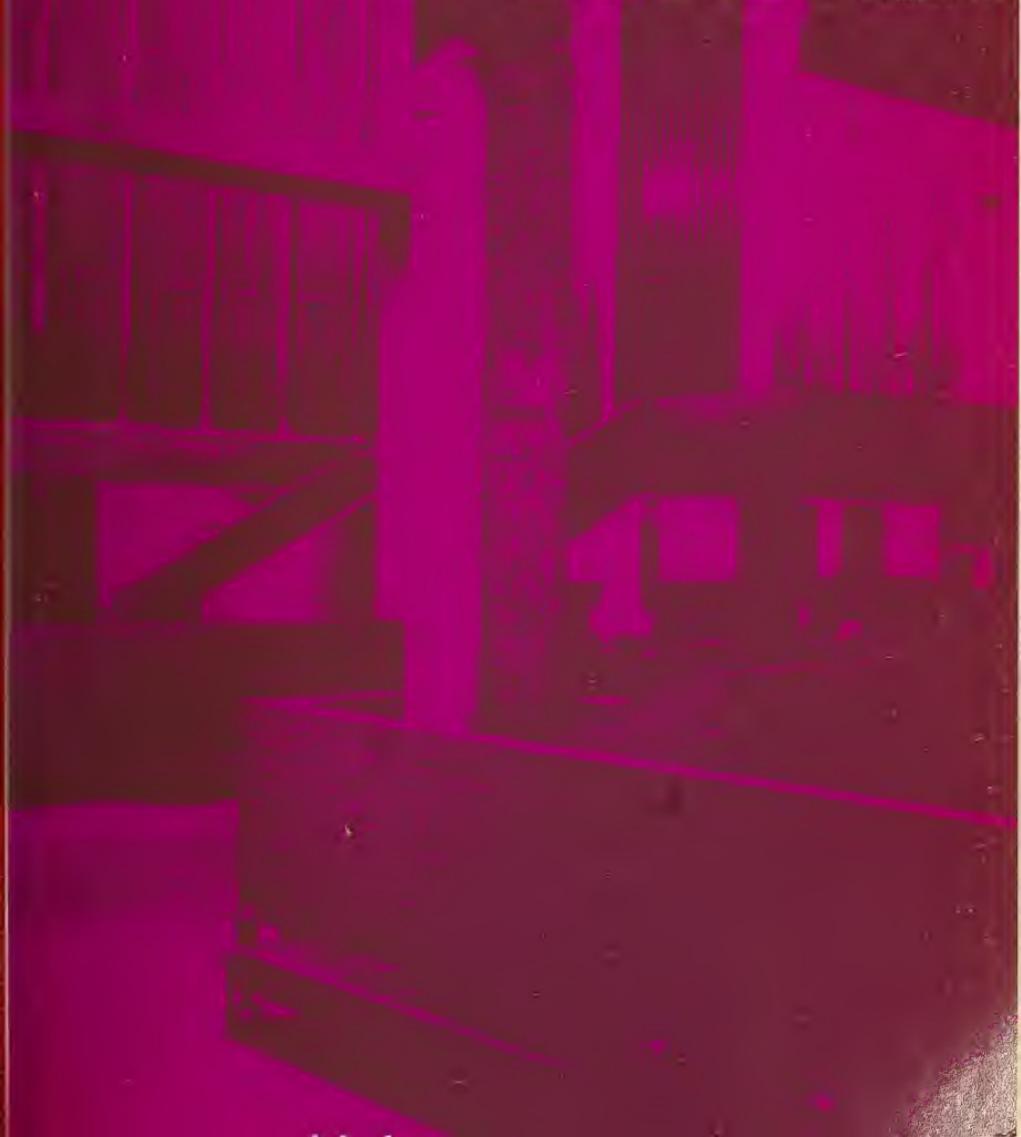
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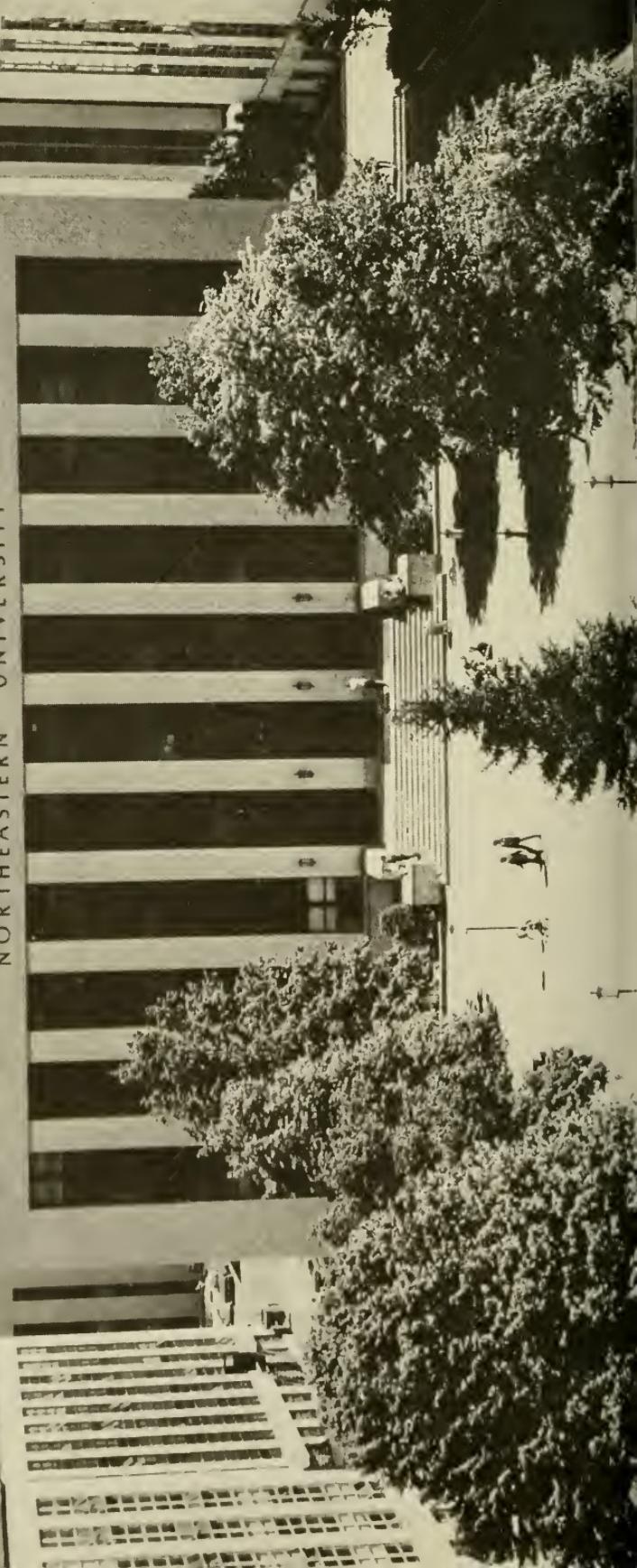
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University College 1974-75

NORTHEASTERN UNIVERSITY



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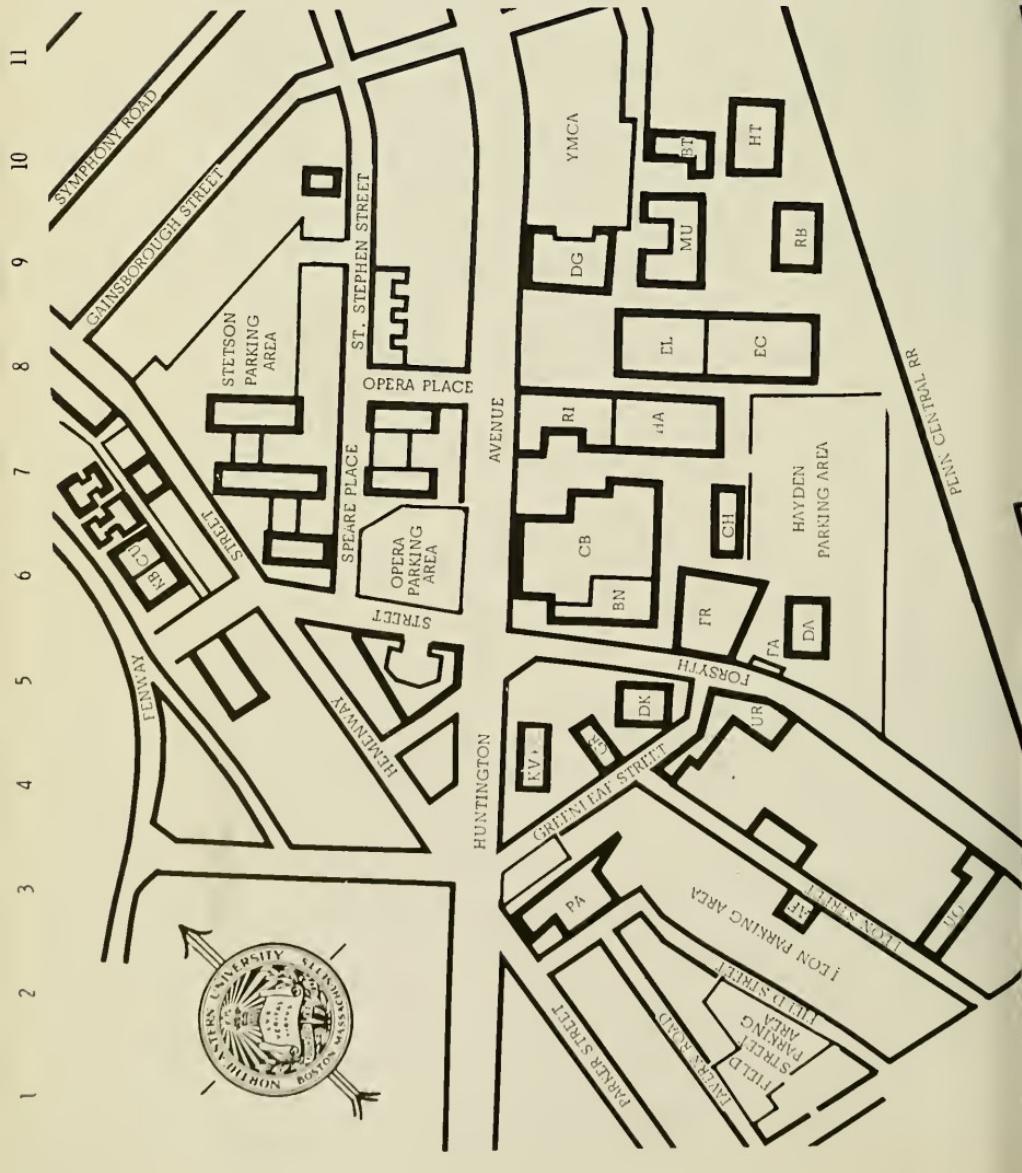
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Building
Designation

BN	Bartlett Natatorium
BT	Botolph Building
CB	Cabot Physical Education Ctr.
CH	Churchill Hall
CU	Cushing Hall
DA	Dana Research Center
DK	Dockser Hall
DG	Dodge Library
EC	Elli Student Center and Alumni Auditorium
EL	Forsyth Building Annex
FR	Greenleaf Building
FA	Hayden Hall
GR	Hurtig Hall
HA	Kennedy Building
HT	Knowles Center (Volpe)
KB	Knowles Center (Gryzmish)
KV	11 Leon Street
KG	Afro-American Institute
MU	Mugar Life Sciences Building
PA	Parker Building
RI	Richards Hall
RB	Robinson Hall
UR	United Reality Building

MAP
REFERENCE



UNIVERSITY COLLEGE OFFICES

Office for General Information	102 Churchill Hall	437-2400
Office of the Registrar	120 Hayden Hall	437-2300

Regular Office Hours

Boston (120 HA & 102 CH)	Monday—Friday	8:30 a.m.—8:30 p.m.
(102 CH)	Saturday	8:30 a.m.—1:00 p.m.
Burlington	Monday—Friday	8:00 a.m.—10:00 p.m.
	Saturday	8:00 a.m.—1:00 p.m.
Framingham North High School	Monday—Thursday	5:30—9:30 p.m.
Lynn English High School	Monday & Wednesday	5:30—9:30 p.m.
Haverhill High School	Monday—Tuesday	5:30—9:30 p.m.
Norwood Junior High North	Monday—Tuesday	5:30—9:30 p.m.
Weymouth High Schools	Monday—Thursday	5:30—9:30 p.m.
Boxford (Masconomet)	Tuesday & Thursday	5:30—9:30 p.m.
Milford High School	Monday—Tuesday	5:30—9:30 p.m.

Summer Office Hours

Boston 102 Churchill Hall	Monday—Thursday	8:30 a.m.—8:30 p.m.
	Friday	8:30 a.m.—4:30 p.m.
	Saturday	Closed
120 Hayden Hall	Monday—Thursday	8:30 a.m.—8:30 p.m.
	Friday	8:30 a.m.—4:30 p.m.
Burlington	Monday—Friday	8:00 a.m.—10:00 p.m.
	Saturday	8:00 a.m.—1:00 p.m.

Program Advisers

Program advisers are available each day and evening by appointment in the University College Office. They are competent to assist the student in planning a program suitable to his general educational and career objectives. They can also answer questions relating to degree requirements, course sequence, and proper scheduling of courses. Appointments may be arranged by calling the University College Office (437-2400) or by coming in person to 102 Churchill Hall. There is no charge for this service.

Program advisers are also available during registration at all registration sites. No appointment is necessary.

Counseling and Testing Center

Counseling and testing to aid a student or prospective student with career, educational, or personal concerns are available days and certain weekday evenings until 8:30 p.m. Information regarding fees and appointments may be obtained by calling 437-2142, or by going to the Counseling and Testing Center, 302 E11 Student Center.

1974-1975 ACADEMIC CALENDAR

Fall Quarter 1974

Classes Begin Monday, September 30, 1974

FALL REGISTRATION DATES

Boston	5:30-8:30 p.m.	Monday-Friday, September 16-20
Boston	9:00 a.m.-12 noon	Saturday, September 21
Boston	5:30-8:30 p.m.	Monday-Thursday, September 23-26
Burlington	5:30-8:30 p.m.	Monday-Thursday, September 23-26
	12 noon-8:30 p.m.	Tuesday, September 17
Boxford (Masconomet Regional)		
Framingham North H. S.	5:30-8:30 p.m.	Tuesday, September 17 and
Haverhill H. S.		Monday, September 23
Lynn English H. S.		
Weymouth North H. S.		
Norwood Jr. H. S. North	5:30-8:30 p.m.	Monday, September 16, and Monday, September 23
Milford H. S.	5:30-8:30 p.m.	
Classes begin		September 30
Columbus Day Observed	No Classes	Monday, October 14
Veterans Day Observed	No Classes	Monday, October 28
Thanksgiving Recess	No Classes	Thursday-Saturday, November 28-30
Final Examination Period For Fall Quarter		Monday, December 16- Saturday, December 21

Winter Quarter 1974-1975

Classes Begin Wednesday, January 6, 1975

WINTER REGISTRATION DATES

Boston	5:30-8:30 p.m.	Monday-Friday, December 16-20
Boxford (Masconomet)	5:30-8:30 p.m.	Tuesday and Thursday, December 17 and 19
Burlington	5:30-8:30 p.m.	Monday-Thursday, December 16-19
Framingham North H. S.	5:30-8:30 p.m.	Monday-Thursday, December 16-19
Haverhill H. S.	5:30-8:30 p.m.	Monday and Tuesday, December 16-17
Lynn English H. S.	5:30-8:30 p.m.	Monday and Wednesday, December 16 and 18
Milford H. S.	5:30-8:30 p.m.	Monday and Tuesday, December 16 and 17
Norwood Jr. H. S. North	5:30-8:30 p.m.	Monday and Tuesday, December 16-17
Weymouth North H. S.	5:30-8:30 p.m.	Monday-Thursday, December 16-19
Christmas Vacation	No Classes	Monday, December 23- Saturday, January 4
Winter Quarter Classes Begin Washington's Birthday Observed	No Classes	Wednesday, January 6 Monday, February 17
Final Examination Period for Winter Quarter		Monday, March 24- Saturday, March 29

Spring Quarter 1975

Classes Begin Monday, April 7, 1975

SPRING REGISTRATION DATES

Boston	5:30–8:30 p.m.	Monday–Friday, March 24–28
Boxford (Masconomet)	5:30–8:30 p.m.	Tuesday and Thursday, March 25 and 27
Burlington	5:30–8:30 p.m.	Monday–Thursday, March 24–27
Framingham North H. S.	5:30–8:30 p.m.	Monday–Thursday, March 24–27
Haverhill H. S.	5:30–8:30 p.m.	Monday and Tuesday, March 24 and 25
Lynn English H. S.	5:30–8:30 p.m.	Monday and Wednesday, March 24 and 26
Milford H. S.	5:30–8:30 p.m.	Monday and Tuesday, March 24 and 25
Norwood Jr. H. S. North	5:30–8:30 p.m.	Monday and Tuesday, March 24 and 25
Weymouth North H. S.	5:30–8:30 p.m.	Monday–Thursday, March 24–27
Spring Recess* (Or Make Up Period for Lost Snow Days)		Monday, March 31– Saturday, April 5
Spring Quarter Begins		Monday, April 7
Patriot's Day Observed	No Classes	Monday, April 21
Memorial Day Observed	No Classes	Monday, May 26
Final Examination Period for Spring Quarter		Tuesday, June 17– Monday, June 23
Commencement		Sunday, June 22

Summer Quarter 1975

Classes Begin Monday, June 30, 1975

REGISTRATION FOR ENTIRE SUMMER QUARTER

Boston	5:30–8:30 p.m.	Monday–Friday, June 16–20
Burlington	12 noon–8:30 p.m.	Tuesday, June 17
Classes Begin		Monday, June 30
Registration for Second Six Week Term		
Boston	5:30–8:30 p.m.	Monday and Tuesday, August 4 and 5
Burlington	5:30–8:30 p.m.	Monday, August 4
Independence Day Observed	No Classes	Thursday, July 4
Labor Day Observed	No Classes	Monday, September 1
Final Examination Period for Summer Quarter		Monday, September 15– Thursday, Sept. 18

Equal Opportunity Policy

Northeastern University is committed to a policy of providing equal opportunity for all. In all matters involving admission, registration, and all official relationships with students, including evaluation of academic performance, the University insists on a policy of nondiscrimination. Northeastern University is also an equal opportunity employer; it is institutional policy that there shall not be any discrimination against any employee or applicant for employment because of race, color, religion, sex, age, or national origin.

the governing boards and officers of the university

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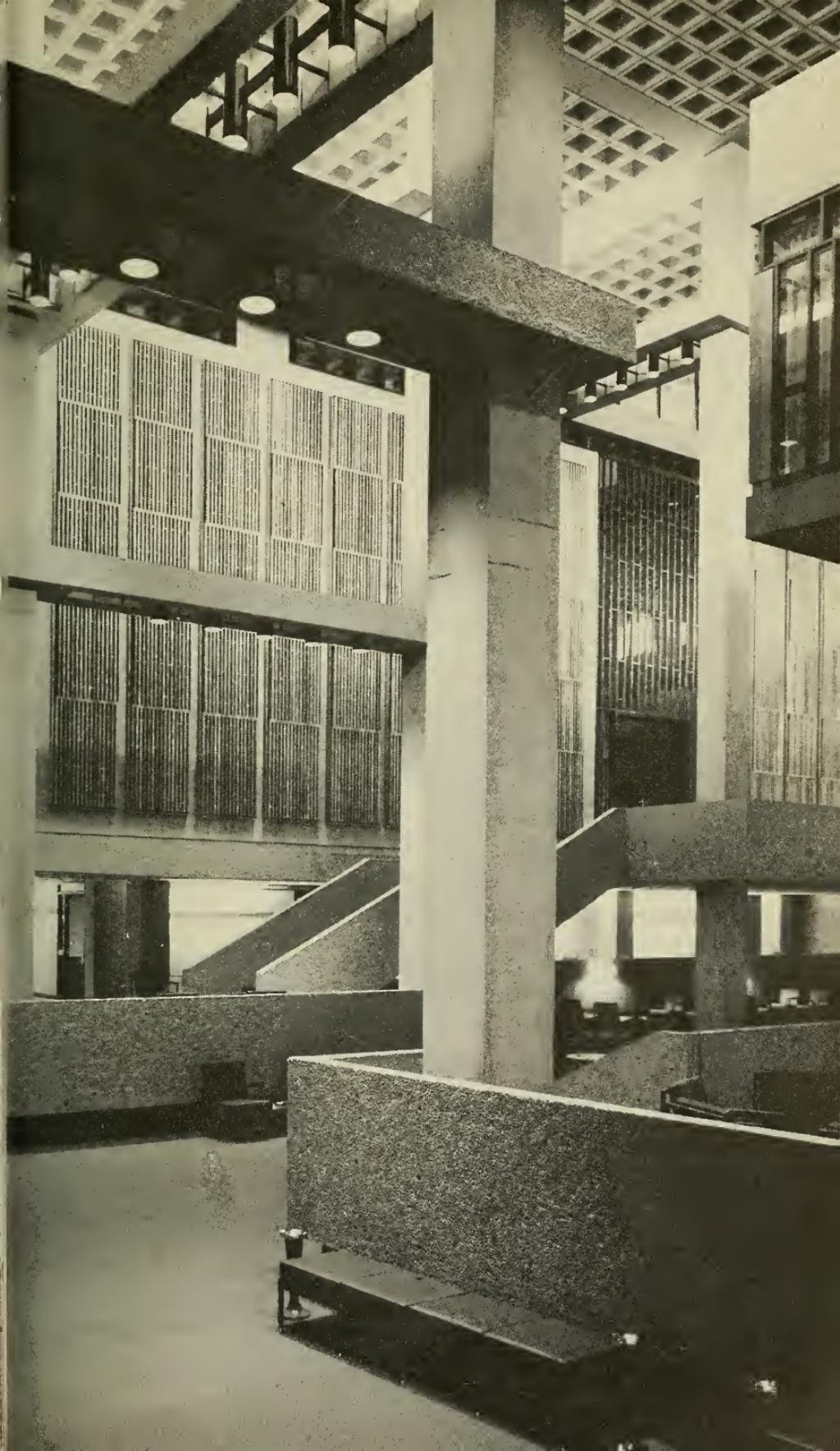
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the university

Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under the General Laws of Massachusetts. By special enactment, the State Legislature has given the University general degree-granting powers. The University is governed by a Board of Trustees elected by and from the Northeastern University Corporation, which comprises more than 178 distinguished business and professional men and women.

From its beginning Northeastern University's dominant purpose has been to identify community educational needs and to meet these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has pioneered new areas of educational service.

A distinctive feature of Northeastern University is its Cooperative Plan, under which students alternate periods of work and study. The Plan was initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922); Liberal Arts (1935); Education (1953); Pharmacy (1962); Nursing (1964); Boston-Bouvé College (1964); the College of Criminal Justice (1967); and by Lincoln College's daytime Bachelor of Engineering Technology program (1971).

This time-tested method of education offers students the opportunity to gain valuable practical experience as an integral part of their college programs and also enables them to contribute substantially to the financing of their education. The "Co-op" Plan has been extended to the graduate level in engineering, actuarial science, professional accounting, business administration, rehabilitation administration, and law.

In the field of adult education, Northeastern University offers graduate and undergraduate degree programs and non-credit programs which are specifically designed to meet the needs and interests of adults who wish to further their education on a part-time basis.

All formal courses of study leading to degrees in the Graduate Division, Lincoln College, and University College are approved by the undergraduate faculties concerned, and are governed by the same qualitative and quantitative standards as the regular day curricula. Courses are scheduled in the day and evening at the Boston Campus, Suburban Campus in Burlington, and at other off-campus locations near Boston.

UNDERGRADUATE COLLEGES

Boston-Bouvé College

Boston-Bouvé College offers four major programs of study: physical education, recreation education, and health education, leading to the degree of Bachelor of Science in Education; and physical therapy, leading to the degree of Bachelor of Science in Physical Therapy.

The combined programs of liberal arts, science, and professional preparation include field experience and student teaching as well as leadership training in camping and outdoor education at the Warren Center for Physical Education and Recreation in Ashland. In accordance with Northeastern's Cooperative Plan of Education, students are offered varied opportunities for alternate terms of work-study experience during upper-class years.

College of Business Administration

The College of Business Administration offers programs of study in the principal fields of business leading to the Bachelor of Science degree in Business Administration. These programs are offered on the five-year Cooperative Plan, under which students gain substantial practical experience as an integral part of their undergraduate course of study.

The College also sponsors a Center for Management Development, which annually conducts an intensive program designed to provide professional growth for middle management executives. The plan of instruction, based on a modification of the Northeastern Cooperative Program, permits the participants to maintain their job responsibilities during the six-month period of the course. The Management Development Program is conducted at Andover, Massachusetts, on the campus of Andover Academy.

The Bureau of Business and Economic Research, concerned particularly with problems of the New England region, is an integral part of the College. The Bureau conducts research projects under faculty leadership using undergraduate cooperative students as research assistants.

College of Criminal Justice

The College of Criminal Justice offers a full-time day curricula on the Cooperative Plan leading to the degree of Bachelor of Science.

College of Education

The College of Education offers programs leading to the degree of Bachelor of Science in Education. These are designed to prepare students for teaching or administrative positions in elementary and secondary schools. Curricula are offered on the five-year Cooperative Plan, which provides employment in libraries, social service agencies, and school systems.

College of Engineering

The College of Engineering offers five-year cooperative curricula in civil, mechanical, electrical, chemical, and industrial engineering leading to the degree of Bachelor of Science with specification according to the engineering department in which the student qualifies, and a more general program without specification leading to the Bachelor of Science degree. A six-year program in power systems engineering in collaboration with public utilities leads to both the bachelor's and master's degree in electrical engineering. The College also offers during evening hours part-time programs leading to Bachelor of Science degrees in Civil and Electrical Engineering. These programs extend over eight years, cover the identical courses given in the day cooperative curricula, and meet the same qualitative and quantitative standards of scholarship.

College of Liberal Arts

The College of Liberal Arts offers majors in the arts and sciences leading to the Bachelor of Arts or Bachelor of Science degrees. With the exceptions of preprofessional programs, curricula are normally five years in length and operate on the Cooperative Plan.

Lincoln College

Lincoln College offers engineering technology programs leading to the degrees of Associate in Engineering, Associate in Science, and Bachelor of Engineering Technology. These programs are made available as:

- (a) A full-time day curricula on the Cooperative Plan leading to the degree of Bachelor of Engineering Technology (B.E.T.) in Mechanical and Electrical Engineering.
- (b) A part-time evening program including pre-technology preparatory courses and degree programs leading to the Associate in Engineering (A.E.); and the Bachelor of Engineering Technology (B.E.T.) in Civil, Mechanical, and Electrical Engineering. The Associate in Science degree may be earned in the mathematical, physical, and chemical sciences.

The day B.E.T. program is designed to meet the needs of the high school graduate or the student transferring from a community college or technical institute and who desires the full time day curricula on the Northeastern Cooperative Plan.

In addition to its traditional curricula, Lincoln College Evening School offers interdisciplinary and certificate programs providing technological and professional development opportunities to meet special needs of the part-time student. These programs are designed to provide trained people for ready assimilation by the engineering field and to prepare students for the challenge of interfacing technology and society.

Recognizing the increasing need for higher levels of technical efficiency in firefighters, Lincoln College, in collaboration with local firefighting agencies, has designed a part-time evening program leading to an Associate in Science degree in Fire Technology. The curriculum includes a broad spectrum of those science technologies which are basic in coping with the fire-fighting problems attendant to the complexities of today's society.

College of Nursing

The College of Nursing offers two separate and distinct programs of study, both organized on the Cooperative Plan:

- (a) A three-year curriculum in preparation for the R.N. Examinations, and leading to the Associate in Science degree.
- (b) A five-year curriculum in preparation for the R.N. Examinations, and leading to the Bachelor of Science degree in Nursing.

Five of Boston's leading hospitals—Beth Israel, Children's Hospital Medical Center, New England Deaconess, Peter Bent Brigham, and Massachusetts General—collaborate with Northeastern by providing suitable cooperative work opportunities during the students' upper-class years in these programs.

College of Pharmacy and Allied Health Professions

The College of Pharmacy and Allied Health Professions offers five-year cooperative curricula leading to the degree of Bachelor of Science in Pharmacy, and to the Bachelor of Science degree with majors in medical laboratory science (medical technology, cytotechnology, and hematology) medical record administration, and management in health care agencies and institutions. Associate degree programs are offered in medical laboratory science, respiratory therapy, dental hygiene, and cytotechnology. The College has academic responsibility and, in cooperation with the medical schools and teaching hospitals in the Boston area, offers the professional program for physician assistants.

University College

University College, so called because it draws upon the resources of the other colleges of the University, offers part-time day and evening programs in liberal arts, business administration, law enforcement, education, health professions, and therapeutic recreation service programs, leading to the Associate in Science, Bachelor of Arts, and Bachelor of Science degrees. It does not duplicate the offerings of the day colleges, but provides curricula which cut across traditional subject-matter areas to meet the particular needs of adult students. Students may pursue a degree or simply take courses, based on needs and interests, up to a total of forty quarter hours of credit. Courses are offered in Boston as well as in Boxford, Burlington, Framingham, Lynn, Haverhill, Milford, Weymouth, and several other convenient locations.

Adult Day Programs refers to University College courses that are offered Monday through Friday, 9:00 a.m. to 5:00 p.m., to meet the needs of adults with family or other obligations who wish to engage in part-time study during the day. In addition to the daytime offering of regular University College credit courses, Adult Day Programs also offers daytime workshops and conferences, sometimes over weekends, with the option for credit. Adult Day Programs are offered primarily on the Boston and Burlington campuses, with a limited number of courses offered at other off-campus locations.

Students may enroll as degree candidates or elect single courses appropriate to their needs and interests. Courses are scheduled in the day and evening at the Boston Campus, Suburban Campus in Burlington, and other off-campus locations near Boston.

GRADUATE SCHOOLS

Actuarial Science

Master of Science in Actuarial Science.

Arts and Sciences

The Master of Arts degree may be earned in economics, English, history, political science, psychology, sociology, and social anthropology. The Master of Science degree is available in biology, chemistry, mathematics, and physics. The Master of Science in Health Science and the Master of Public Administration degrees are also offered. In addition, there are programs leading to the Doctor of Philosophy Degree in biology, chemistry, economics, mathematics, physics, psychology, and sociology.

Boston-Bouvé College

Master of Science in Physical Education and Master of Science in Recreation education.

Business Administration

Master of Business Administration.

Criminal Justice

Master of Science in Criminal Justice

Education

Master of Education, and the Certificate of Advanced Graduate Study.

Engineering

Master of Science with course specification, including a special six-year program in Power Systems Engineering leading to both bachelor's and master's degrees in Electrical Engineering; a similar six-year program in Mechanical Engineering leading to both bachelor's and master's degrees; the Master of Science degree in Civil Engineering; master's degrees in the fields of Industrial Engineering and Engineering Management; the professional Engineer degree in Electrical Engineering; the Ph.D. in the fields of Electrical, Chemical, Civil, and Mechanical Engineering; and Doctor of Engineering degree in Chemical Engineering. In addition, the intermediate degree of Engineer is offered.

Law

The School of Law offers a full-time program of professional instruction leading to the degree of Juris Doctor (J.D.). The three-year curriculum includes twelve months of experience in law offices. There are no courses for part-time or evening students.

Pharmacy and Allied Health Professions

Master of Science with specialization in Hospital Pharmacy, Industrial Pharmacy, Medicinal Chemistry, Pharmacology, Medical Laboratory Science, and Doctor of Philosophy in Medicinal Chemistry.

Professional Accounting

A five-quarter curriculum leading to the degree of Master of Science in Accounting.

INSURANCE INSTITUTE

The Insurance Institute, which is sponsored by local insurance organizations and companies, has recently joined University College. It offers a number of non-credit courses in preparation for the Chartered Life Underwriter and Chartered Property-Casualty Underwriter Designations as well as for the General Insurance, Insurance Adjuster, and Risk Management Certificates. (437-2506).

CENTER FOR CONTINUING EDUCATION

The Center for Continuing Education was established to relate the University to the needs of its community in a period of accelerated change. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. The Division of Special Programs, working cooperatively with trade associations and professional societies, offers several programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Boston, Massachusetts.

RESEARCH ACTIVITIES

The faculties of the University are engaged in a wide variety of basic research projects in business, science, social science, pharmacy, and engineering. These are coordinated by the Dean of Research, whose services are University-wide and available to the faculties of all the Colleges.

Although Northeastern is primarily concerned with undergraduate and graduate instruction, the University believes that the most effective teaching and learning takes place in an environment characterized by research activities directed toward extending the frontiers of knowledge.

buildings and facilities

The main campus of Northeastern University is located at 360 Huntington Avenue in the Back Bay section of Boston. Many of the city's famous cultural, educational, and philanthropic institutions are situated in the Back Bay, including the Museum of Fine Arts, Symphony Hall, Horticultural Hall, the Isabella Stewart Gardner Museum, the Harvard teaching hospitals, and many schools and colleges. Most are within walking distance of Northeastern University.

Major transportation facilities serving the Boston area are Logan International Airport, two rail terminals, bus terminals serving inter- and intrastate lines, and MBTA subway-bus service within the metropolitan-suburban area. There is a subway stop in front of the campus. For motorists, the best routes to the campus are the Massachusetts Turnpike (Exit 22) and Route 9, of which Huntington Avenue is the intown section.

The campus of 47 acres is divided by Huntington Avenue, with the main educational buildings on one side and dormitories on the other. The principal buildings, all of which have been constructed since 1938, are of glazed brick in contemporary classic style. Most are interconnected by underground passageways.

Carl S. Ell Student Center

The Carl S. Ell Student Center provides facilities for student recreation and for extracurricular activities. The Alumni Auditorium, with a seating capacity of 1,300, is part of the Center. Also included are special drama facilities, a ballroom, main lounge, fine arts exhibition area, student offices, conference rooms, and a dining area seating more than 1,000.

The University Library

The Dodge Library is the main library on the Boston campus and maintains an open-stack system. Bound volumes in the library system exceed 360,000, and microfilm titles, 267,000. Collections are located in these areas:

1. The General Collection in the book stacks as indicated by the classification number given in the upper left corner of the catalog card.
2. The Reference Collection in the Cabot Reading Room to the left of the Circulation Desk, which includes bibliographies, maps, company publications, the pamphlet file, and association publications. Theses, under the supervision of the Reference Dept., housed in the basement, and available on request in the Reference Room.
3. The Periodical Collection in the Webster Reading Room to the right of the circulation desk, consisting of current periodicals, periodical indexes, and abstracts, with two adjacent stack levels for back files of

bound volumes. The Microfilm Collection in room 108, adjacent to the Webster Reading Room.

4. The Reserve Book Collection on the second floor.
5. The Foreign Literature Collections in the Webster Reading Room to the right of the Circulation Desk.
6. The Collections of Fine Arts, housed in the Richardson Room on the second floor. The Audio Facility for spoken and music recordings and magnetic tapes for instructional and individual use also located in this room.
7. The American and English Literature Collections in the Literature Reading Room.
8. Government Documents maintained on the basement level.

The Card Catalog is a union list of materials in the University libraries and is located in the Webster Reading Room. There are also book catalogs of the collections in the Math/Psych Library, Chemistry Building Library, Documents and Reserve Rooms. There is an Information Desk in this room to assist people in using the card catalog during the day.

The Circulation Dept. has a printed list of all materials charged out, which may be consulted by all users. To borrow materials, University identification must be presented. For extensive research, where the University Library does not have the material, application should be made to the Inter-Library Loan Librarian for materials needed from other libraries. Information service is available in this department in the evenings.

Library Hours — Boston Campus

Monday — Thursday	7:45 a.m. to 10:00 p.m.
Friday	7:45 a.m. to 7:30 p.m.
Saturday & Sunday	1:00 p.m. to 5:00 p.m.

The University Library System includes three graduate libraries in the Division of Research. Physics-Electrical Engineering is housed in 325 Dana Research Center. Mathematics-Psychology is housed on the fifth floor of the United Realty Building and Chemistry is located on the first floor of Hurtig Hall.

Library Hours — Suburban Campus, Burlington

Monday — Friday	8:30 a.m. to 9:00 p.m.
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Cabot Physical Education Center

The Godfrey Lowell Cabot Physical Education Center is one of the best equipped in New England. It contains four basketball courts, an athletic cage, a women's gymnasium, and a rifle range, as well as administrative

offices for the Department of Athletics and for the Physical Education Department of Boston-Bouvé College.

A recent addition to the center, the Barletta Natatorium, houses a 105-foot swimming pool, a practice tank for the crew, handball courts, and shower and dressing facilities.

Dockser Hall

Charles and Estelle Dockser Hall, completed in 1968, houses a large gymnasium, dance studio, motor performance laboratory, college library, community recreation laboratory, folk arts center, dark and music rooms, recreation resources area, locker rooms, offices, classrooms, conference room and lounge, storage facilities, and a research laboratory.

Suburban Campus

The Suburban Campus, located near the junction of Routes 128 and 3 in Burlington, Massachusetts, was established to meet the needs of individuals and of industry in the area.

In addition to graduate courses in engineering, physics, mathematics, business administration, science, education, and the arts, portions of undergraduate programs leading to the associate and bachelor's degrees, special programs for adults, and non-credit state-of-the-art programs are offered.

Henderson House

The University's conference center, Henderson House, is located in Weston, Massachusetts. The Center for Continuing Education conducts short-term courses, seminars, and special institutes for business, professional, and research groups. Henderson House is 12 miles from the main campus.

Warren Center

The Warren Center for Physical Education and Recreation in Ashland, Massachusetts, serves as a year-round outdoor laboratory for students in Boston-Bouvé College. There are facilities for conferences, special education in arts and crafts, and sports—including aquatics. Buildings include a lodge, cottages, and an infirmary.

Marine Science Institute

The Marine Science Institute at Nahant, Massachusetts, about 20 miles northeast of Boston, is a research and instructional facility primarily engaged in studies of marine biology and oceanography. The Institute is operated the year around.

Brockton, Nashua, and Framingham Campuses

For students residing in southeastern Massachusetts and northeastern Rhode Island, the Graduate School of Business Administration offers a major portion of its M.B.A. Program at facilities in Brockton, Massachusetts. These facilities, made available by the Veterans Administration Hospital, are conveniently located just off Route 24.

Students residing in the southern New Hampshire area may take a major portion of the M.B.A. Program at facilities in Nashua, New Hampshire. These facilities are furnished by Sanders Associates, Inc. and are located in their headquarters on Route 3, just over the Massachusetts line.

For students in the Framingham-Worcester area, a major portion of the M.B.A. Program may be taken at classroom facilities located in Framingham, Massachusetts.

university college

The Programs

University College is committed to the education of mature, adult students who wish to live effectively in today's complex society. The programs in University College are specifically designed to satisfy the changing professional, cultural, and social needs and interests of adults.

Degree programs have been developed in 39 major fields of study in the areas of business administration, education, liberal arts, law enforcement, and health-related programs. Flexible curricula are offered on a part-time basis Monday through Saturday during day and evening hours convenient to adult students. Students may elect single courses or may enroll in full degree programs leading to the Associate in Science or the Bachelor of Science degree. Short-term seminars are also offered for credit. Classes are scheduled in locations which are accessible to the urban and the suburban community. Students may attend classes at the Huntington Avenue Campus, Boston, or the Suburban Campus, Burlington, Massachusetts, as well as other off-campus locations north, south, and west of Boston.

University College programs are constantly evaluated and redesigned when necessary in order to keep pace with the changing needs and interests of its students and the community.

The Faculty

Approximately 800 men and women comprise the part-time teaching staff of University College. Included are members of the full-time faculty of the Basic Colleges of Northeastern University and other educational institutions in New England, as well as outstanding New England business and professional leaders with backgrounds of training and experience in specialized areas. The faculty are selected because they are highly successful in their fields and are well qualified to provide sound methods of teaching for adults in an interesting, inspiring, and effective manner.

The Student Body

The student body of University College represents diversified interests which properly recognized and utilized become one of the basic strengths in adult education. There are approximately 12,000 students in University College who range in age from 18 years to beyond retirement. While some

students enroll in University College immediately after high school graduation, others may have graduated 25 years prior to enrollment in college-level courses.

University College students are men and women who have full-time commitments to their jobs, families, or other responsibilities. They may enroll in a single course or in a full degree curriculum, depending on whether their goal is job advancement, a new career, or personal enrichment.

academic policies

Admission

All applicants who satisfy the requirements as regular or special students are admitted as part-time students in University College. It is advisable for students to have an interview with an admissions counselor to help plan their academic program in University College, particularly in cases where previous credit has been completed at other institutions, in order to avoid possible duplication of courses. Because of the diversity of the student body in terms of background, age, interests, needs, etc., there are no entrance examinations and college board examination scores are not required. In lieu of entrance examinations, students must maintain a C average in order to be admitted to degree candidacy.

Regular Students

To be enrolled as a regular student, that is, to become a degree candidate, the applicant must have completed an approved secondary school course or the equivalent 15 units* of a high school diploma. Equivalency certificates are accepted. Regular students are those students who expect to follow a degree program.

Special Students

Special students are those students who do not wish to enroll in a full degree program, but are interested in taking only one or more courses appropriate to their needs or interests. Credits for these courses may be transferred to a degree program if the student desires to pursue a degree at a later time.

Foreign Students

Only those University College students who have matriculated as degree candidates and are attending as full-time students are eligible for an 1-20 Certificate of Eligibility for a student visa.

Information concerning foreign students should be requested from the Office of International Student Affairs, 205 Ell Building. Office hours: 8:30 a.m. to 4:30 p.m., Monday through Friday.

Procedure for Admission As a Degree Candidate: Matriculation

Petition forms for admission to the status of a degree candidate are available at offices on all University College Campuses. There are two methods of matriculation:

*A unit represents a year's work in any subject in any approved secondary school constituting approximately a quarter of a full year's work, or the equivalent. A four-year day high school course is regarded as representing at least 15 units of work, or 3 units in junior high school and 12 units in a three-year high school.

A. Standard Method of Matriculation

1. If a student has completed 40 quarter hours of credit in University College, he cannot register for additional courses unless he has been officially accepted as a degree candidate.
2. In order to matriculate as a degree candidate, the student must have a high school diploma or its equivalent and must achieve a cumulative quality point average of 2.00 (an average grade of C) for all courses completed before filing the petition. In the Liberal Arts Program, the 8 quarter hours of required English must be completed prior to matriculation.
3. **Optional Method of Matriculation by Transfer Students.**
 1. If a student has successfully completed an associate degree program at another accredited institution, he may file for matriculation following one quarter in residence in University College.
 2. If a student has completed 40 quarter hours at another accredited institution, he may file for matriculation following one quarter in residence in University College.
 3. If a student has completed 40 quarter hours of combined credit from another accredited institution and University College, he may file for matriculation.

All students who file for matriculation must have a high school diploma or its equivalent, a cumulative quality point average of 2.00, and, if in the Liberal Arts Program, 8 quarter hours of required English.

A student who matriculates via Method B, is required to obtain written permission from his Program Director before taking courses in another institution subsequent to matriculation in University College.

The Committee on Academic Standing may require a student to take one or more aptitude or interest tests if his credentials or academic record fail to give evidence of probable academic success. In this case, the student will be notified in writing that arrangements for testing should be made by him with the University Counseling and Testing Center. A fee is charged for administering these tests.

Advanced Standing Credit

After completion of matriculation requirements in University College (40 quarter hours in residence) Advanced Standing Credit may be obtained in two ways:

Transfer of Credit from Another Institution

Subject to approval by the Director of Admissions, credit may be granted for work completed in other approved schools, colleges, or universities. An applicant who wishes to receive credit by transfer should petition for transfer credit with the Director of Admissions. He should then write to the registrar of the institution previously attended and request that an official

transcript be sent to the Director of Admissions in University College. The transcript indicates honorable dismissal, courses completed, credits and grades received. The transcript should be sent well in advance of the registration period, and after filing the petition for transfer credit, the applicant should inform the Director of Admissions of his major field of interest so that the transcript will be evaluated appropriately.

Students who anticipate taking courses at other Colleges or Universities while enrolled in University College must secure permission in advance from the appropriate program director in University College.

Students who have been dismissed from another institution for academic reasons must accompany their application with a statement from the dean or other appropriate official of their previous institution setting forth the reasons for dismissal or probationary status with recommendation for continued study. All applicants will be considered on their own merits.

By Examination

Credit is granted for successful completion of appropriate examinations in the College Level Examination Program (CLEP). Credit may be disallowed for work previously completed because of the remoteness of the time of study; however, these applicants may take CLEP Examinations where appropriate. Credit is also granted for non-collegiate experience in both the Liberal Arts and Law Enforcement Programs. See pages 80, and 102.

In all cases students admitted by transfer or advanced standing credit from any other institution must meet the requirements for matriculated status as set forth under the regulations applicable to regular students.

Residence Requirement

Every candidate for the baccalaureate or associate degree must fulfill the residence requirement. The residence requirement is defined as the satisfactory completion in University College immediately preceding graduation of 46 consecutive quarter hours of work in course, with the further provision that at least 12 of the 46 quarter hours must be in the candidate's major field. All programs to meet the residency requirement must have the approval of the Dean. Students whose attendance in degree programs is interrupted for a period of one year or more will be reinstated into the program in effect at the time of their re-entry into University College.

In the case of students who for causes beyond their control move outside of the reasonable commuting area of the College, and who have completed 134 or more quarter hours of credit in course, the Committee on Education will entertain a petition to allow them the privilege of completing their degree requirements at some other approved college. Under no circumstances will a degree be awarded to any student who has completed less than 46 quarter hours of credit in courses in University College.

Quality Requirement for Graduation

A cumulative quality point average of 2.00 (an average grade of C) is required for graduation. Advanced standing credits are not averaged in the cumulative score.

Graduation with Honor

Candidates who have achieved distinctly superior attainment in their academic work will be graduated with honor. Upon special vote of the faculty a limited number of this group may be graduated with high honor or with highest honor. To be considered for graduation with honor, a student must have completed a minimum of 72 quarter hours of work at University College. Courses credited by advanced standing will be eliminated in determining honor graduates.

Attendance at Commencement

Attendance at commencement for all University College degree candidates is optional. Degree candidates will be polled by the commencement committee in this regard during the Spring Quarter.

A petition to receive a degree *in absentia* must be presented to the Dean. Each petition will be acted upon by the Dean.

Quality Points

The requirement for graduation from University College is 174 quarter hours with attainment of a quality point average of 2.00. Although the credits allowed for acceptable work completed elsewhere by transfer students count toward fulfillment of quantitative graduation requirements, neither the credits nor the grades earned in such courses are included in quality point computations for graduation.

The method of figuring quality points is as follows: Each quarter hour credit of A grade is multiplied by 4, B grade by 3, C grade by 2, D grade by 1, and F grade by 0. The total number of quality points, divided by the total number of quarter hour credits completed, shall be the quality point average.

Students receiving an F grade in a required course must repeat the course in its entirety including term work, examinations, and attendance.

Quality Point Averages

The Registrar's Office will not be able to recalculate or confirm the calculations of quality point averages for individual students. Each student's record will be brought up to date before his graduation. In the meantime, borderline cases will be checked by the Director of Admissions of University College.

Dean's List

All matriculated students who have taken a minimum of 18 quarter hours in three consecutive quarters (Fall, Winter, Spring) of an academic year and

have completed all their courses with an average of 3.0 or better shall be placed on the Dean's List. Each student shall receive a letter of commendation from the Dean of University College.

Pass-Fail Courses

Any student who is not on academic probation and who has completed 40 Q.H. of academic work may register for one pass/fail course and, thereafter, for one course on a pass/fail basis for each 10 Q.H. of successfully completed work. Written permission of the appropriate academic dean must be obtained for each pass/fail course. At no time may a student register for more than one pass/fail course per quarter.

Such courses will be restricted to free electives outside the major field of specialization, so that no part of the specifically prescribed curricula will be affected.

The grades recorded on the basis of the pass/fail system of grading will not figure in the computation of the QPA.

Satisfactory completion of the work in all courses taken on the pass/fail system of grading will be designated on the transcript by the letter "S." Unsatisfactory work will be designated on the transcript by the letter "U." Any unsatisfactory grade must be handled according to the existing policy of the University, but must never be cleared through the election of the same course on the basis of the pass/fail system of grading.

An incomplete in a course taken on a pass/fail basis will be designated by the letter "X" on the transcript and must be treated according to the normal procedure for incomplete grades.

The following REGISTRATION PROCEDURES shall prevail:

Students wishing to use the pass/fail system of grading for a course must meet all prerequisites for such course and should signify their desire to apply for a specific course on the basis of this system of registration.

The student's decision to take a course on a pass/fail basis must be made prior to the second meeting of the course and no changes will be permitted thereafter.

Class Changes

University College reserves the right to cancel, split, or combine classes when necessary.

Registration

Before attending classes, students must report to the registration area to register. All students must complete their registration properly before attending class. Attendance at class, even with the instructor's permission, does not constitute registration.

No academic credit will be recorded for students not properly registered.

In order to insure academic success, students are strongly advised to adhere to course prerequisites.

Class Attendance and Preparation

Students are expected to attend all exercises in the subjects they are studying unless excused in advance.

Absence from regularly scheduled exercises in any subject will seriously affect the standing of the student. Consecutive absences may cause the removal of the subject or subjects from the student's schedule.

Two hours of preparation are normally required for each hour spent in the classroom.

Withdrawal Policy

A student may be withdrawn from a course in several ways:

VOLUNTARY WITHDRAWAL—The student completes a drop course form in the Registrar's Office or notifies the Registrar in writing of his intention to withdraw from the course.

INITIAL ABSENCE WITHDRAWAL—If a student is absent without permission from the first three meetings of a course, he will be withdrawn by the Registrar.

END OF COURSE WITHDRAWAL—If, by the ninth or tenth week of the quarter, the Registrar, after examining the attendance book, has every reason to believe the student has dropped from the course, he will officially withdraw the student and so note in the attendance book.

Change of Address

Change of address and/or name should be reported immediately to the Registrar's Office.

Absence Because of Illness

All students who are absent from school because of extended illness, and do not wish to be withdrawn, should inform the Registrar's Office by letter.

Examinations

Term tests are scheduled in each quarter at the option of the instructor and are regarded as part of the term's course work. A final examination will be held at the end of each quarter in each course unless an announcement to the contrary is made.

Homework Assignments

Students are responsible for obtaining their homework assignments by contacting their instructor or another student in their class. Homework assignments are not available in the University College Office.

Missed Final Examinations

A student does not automatically have the right to make up a missed final examination. Students must petition for this privilege and must pay a fee of \$5.00 for each special examination when filing for the special make-up exam. All students who wish to clear an I (incomplete) grade must pay the fee and file the proper petition in the Registrar's Office, 120-HA, or in each off-campus administrative office. Petitions for missed finals must be filed in accordance with the schedule listed below:

final examination missed during:	file petition no later than:	make-up final exam during week of:
Fall Quarter 1974	January 24, 1975	February 17, 1975
Winter Quarter 1975	April 25, 1975	May 19, 1975
Spring Quarter 1975	July 8, 1975	August 11, 1975
Summer Quarter 1975	October 10, 1975	November 3, 1975

Students will be notified by mail when and where to take the missed final examination. All examinations will be administered on the Boston Campus.

Students who do not take make-up final examinations as scheduled (see below for I grade explanation) and clear an incomplete through the instructor, will be billed the \$5.00 make-up exam fee by the Bursar before the I grade is changed.

Grading System

The following system of grading is used. The numerical equivalent for each grade is in parentheses.

A (4.0) — Outstanding	L — Audit (No Credit)-UC and LC only
B (3.0) — Good	S — Satisfactory (Pass-Fail Grade)
C (2.0) — Satisfactory	U — Unsatisfactory (Pass-Fail Grade)
D (1.0) — Poor	X — Incomplete (Pass-Fail Grade)
F (0.0) — Failure	* — Grade not received
I (—) — Incomplete	

A general average of "D" is unacceptable and will not allow a student to continue in University College or to receive a degree from Northeastern University. The "F" grade is a definite failure and requires repetition of course in its entirety. The "I" grade is given only when the student fails to take the final examination.

The I Grade

The I grade may be given only when the student fails to take the final examination.

An instructor may decide that a student has done so poorly in the course that even a perfect grade in a makeup final could not raise the grades from F, in which case F is the proper grade, irrespective of the missed final.

If the student fails to complete some other major portion of the course work (examination, quizzes, major paper, etc.) a letter grade (A, B, C, D, F) should be assigned. This grade can be changed, upon petition, when the deficiency which led to the assigned letter grade is made up to the satisfaction of and in the manner prescribed by the instructor.

All deficiencies must be made up in the prescribed manner no later than the quarter following the recording of the grade.

*Grade Reports

An official grade report will be mailed approximately three weeks after the quarter is completed to each registered student. Grades will not be given over the telephone or at the Registrar's Office.

Auditing Policy

Students are permitted to audit courses upon filing the usual registration forms and paying the regular tuition fees. There is no reduction in fees for auditing. An auditor may participate in class discussion, complete papers and projects and take tests and examinations for informal evaluation, if desired. However, regardless of the amount or quality of work completed, **no academic credit will be granted at any time for courses audited.**

Audit Procedure

The student's decision to take a course on an audit basis must be communicated in writing to the Registrar prior to the fourth class meeting of the course. No exception to this procedure can be approved without authorization by the Academic Standing Committee of the College.

Calculation of Quality Point Average

1. When the student has more than one grade in the same course, the most recent grade will be used in the calculation of the quality point average.
2. A grade of "I" will not be considered in the calculation of quality point average.
3. Although advanced standing credits (ASC) allowed for acceptable work completed at other institutions by transfer students count toward completion of the quantitative credit requirements, neither the credits nor the grades earned in such courses are included in quality point average computations.

For example, a student who has registered for seven courses, cleared a failure in one of them, and received advanced standing credit (ASC) in another, may calculate his quality point average as follows:

^{*}A supplementary grade report will be issued when the missing grade is received. Please do not call the Registrar's Office for it. University regulations prohibit issuing grades by telephone.

S, U, X, I and L grades are not included in the Quality Point Average. "S" grades are included in "Earned Hours" toward the degree. Cumulative totals do not appear on reports for non-matriculated students.

Grade Achieved	Numerical Equivalent	Credit Hours	Quality Points
A	4.0	X 4	= 16.0
B	3.0	X 4	= 12.0
C	2.0	X 3	= 6.0
D	1.0	X 3	= 3.0
F	0.0	X 2	= 0.0
F B	3.0	X 2	= 6.0
I	—	X —	= —
ASC	—	X —	= —
		Totals 18	43.0

$$\text{Quality Point Average} = \frac{\text{Total Quality Points (43.0)}}{\text{Total Credit Hours (18)}} = 2.389$$

Academic Probation

Students whose scholarship in any given period is unsatisfactory may be dropped from the College or may be placed on probation.

Disciplinary Action

The Committee on Regulations and Discipline has the authority to dismiss from the College or place on probation at any time or to strike from the list of candidates for the degree, any student deemed unworthy because of conduct or character.

Maximum Course Load

New students may elect up to five (5) subjects per quarter without special permission.

Former students, who are not on the Dean's List, may also elect up to five (5) subjects per quarter without special permission. Program Directors may allow six (6) subjects if the student has a 2.50 Q.P.A. or better.

Dean's List students may elect any number of subjects per quarter not to exceed sixteen (16) quarter hours without special permission.

Not all the courses listed in this bulletin will be offered. A final list of those classes to be offered will be contained in the University College Schedule of Courses which gives the hours, days and location of classes. This schedule is issued prior to the Fall, Winter, Spring, and Summer Quarters.

Changes in Requirements

The continuing development of University College forces frequent revision of curricula. In every new bulletin some improvements are indicated. When no hardship is imposed on the student because of changes, and when the facilities of the school permit, the student is expected to meet the requirements of the latest bulletin. If the student finds it impossible to meet these requirements, the bulletin for the year in which he entered becomes the binding one.

tuition and fees

Tuition and fees are refundable only as stated under "Refund of Tuition." Checks and drafts for all charges are to be drawn to the order of Northeastern University.

Initial Registration Fee

A ten dollar (\$10.00) registration fee, required of all new students is due and payable upon registration. This fee is nonrefundable.

Tuition

Tuition for all credit courses is \$32.00 per quarter hour of credit. Charges for registration and tuition for special courses are at the rate specified for each course. Students are permitted to audit courses, however, there is no reduction in fees for auditing.

Non-credit courses are charged at quarter hour rates comparable to those of credit courses meeting on an equivalent contact hour schedule.

Students are not permitted to attend class sessions or take any examination or test until they have paid their tuition fees or have made satisfactory arrangements for payment.

Students will not be advanced in class standing, or permitted to re-enroll in the University, nor will degrees be conferred until all financial obligations to the University have been met.

No certificate of honorable dismissal will be issued to any student who has not fully met his financial obligations to the University.

Tuition Budget Payment Plans

Occasionally situations develop—usually beyond the control of the student—which make it difficult to meet the payments in the manner outlined above. Under such circumstances the student is advised to discuss his problem personally at the Bursar's Office, where one of the budget plans or a deferred payment agreement may be worked out. Such arrangements should be made before the end of the first week of the quarter or within one week of the date of registration if the student enters late. A charge of \$2.00 will be made. Failure to take immediate action will result in a late payment fee of \$10.00.

Tuition Underwritten by Employers

An increasing number of companies are underwriting part or all of the cost of tuition of students in their employ. In cases where payment is to be made directly by the employer to the University, the student should furnish to the Bursar's Office a purchase order covering his registration or a statement from an officer of his company certifying that the company is underwriting the tuition.

Veterans' Benefits

Any veteran covered by Public Law 89-358 should report to Room 245 Richards Hall to fill out the proper enrollment forms.

Late Payment Fee

Bills for tuition and fees are payable on or before Saturday of the week of issuance. A late payment fee of \$10.00 is charged for all students failing to comply unless special payment arrangements are approved by the Bursar's Office.

Refund of Tuition

The general policy in all schools and colleges of the University with respect to refunds of tuition to students is as follows:

The University provides all instruction on an academic quarter basis for which students pay at the beginning of each quarter. Tuition refunds will be granted through the first four weeks of a quarter only when specific conditions are met. Questions regarding refunds should be discussed with the Bursar.

Tuition refunds will be granted only on the basis of the date appearing on the official withdrawal application when filed with the Registrar in Room 120 Hayden Hall. Non-attendance does not constitute official withdrawal.

Refunds will be granted in accordance with the following schedule:

official withdrawal filed within:	percentage of tuition
1st week of quarter	100%
2nd week of quarter	75%
3rd week of quarter	50%
4th week of quarter	25%

Courses in Other Departments of the University

University College students assigned to courses in other departments of the University are charged the tuition rates and other fees effective in the departments in which they are enrolled.

Student Center Fee

All students in University College on the Huntington Avenue Campus are charged \$.75 each quarter for the services available in the Student Center.

Laboratory Fee

All students enrolled in chemistry, biology, or health professions courses which include laboratory must purchase from the Bursar's Office a Laboratory Fee and Deposit Card for \$15.00 (\$5 for extra cards). The fee for arts and crafts courses is \$5.00. Upon completion of the course or withdrawal during the quarter, the student must check out his status with the laboratory attendant. The Bursar's Office will then refund any unused balance shown on the Laboratory Fee and Deposit Card.

Graduation Fee

The University graduation fee, charged to those who are candidates for the baccalaureate or associate degree, is \$25.00 payable on or before May 1 of the year in which the student expects to graduate.

Missed Final Examination Fee

Students absent from the regularly scheduled final examination at the end of a course may petition for a "Missed Final Examination." The fee for each examination requested by the student is \$5.00. The fee must be paid when the petition is filed in the University Registrar's Office.

Transcripts

Students may request transcripts of their grades at the Registrar's Office. There is a charge of \$1.00 per copy, payable in advance.

financial aid

General information pertaining to financial aid opportunities and specific scholarship applications for part-time students are available in the University College Admissions Office, Room 102 Churchill Hall.

The following scholarships and awards are available to students enrolled in University College.

Professor Joseph A. Mullen Scholarships

The Massachusetts Chapter of the American Society of Training and Development has established a fund to provide annual scholarship awards to deserving part-time students upon the recommendation of the Dean of University College.

Dean Russell Whitney Memorial Scholarship

Alpha Chapter of the Pi Tau Kappa Fraternity sponsors an annual tuition scholarship in memory of former Dean Russell Whitney. The award is made available to the man in University College whose qualities of leadership and influence on his fellow students, strength of character, and record of scholarship and broad achievement mark him as outstanding. The award is made available to the student who has completed a minimum of 80 quarter hours. To be eligible for this scholarship, the student must pursue a normal schedule during the year in which the award is made.

Martin Luther King Jr. Scholarships

Established in 1969 in memory of the late Rev. Martin Luther King Jr. Awards are made as openings occur, to adults from minority groups who would otherwise be unable to continue their education. Stipends will cover tuition expenses not to exceed six quarter hours in any academic quarter (excluding Summer Quarter).

Kappa Tau Phi Scholarships

Kappa Tau Phi Sorority annually makes available scholarship awards. They are granted to women students in the liberal arts, business, and engineering programs, respectively, who rank highest in their class at the end of the upper-middle year. In the event the student is eligible for an award of greater monetary value, the award will be made to the next highest-ranking

woman student. To be eligible for this scholarship, the student must be enrolled in a program of at least two evenings per week and must be a candidate for the bachelor's degree. In determining this award, grades of all courses completed in prior years shall be considered.

Harry Olins Scholarship

The Harry Olins Scholarship Fund was established as an expression of firm belief in University College students and "what they stand for." The fund, presented by Mrs. Harry Olins in recognition of her husband's long service on the faculty, makes available an annual tuition award to two students who in terms of scholastic achievement, character, and personal need best typify the spirit of Northeastern University.

To be eligible for this award, the student must be a degree candidate and carry a full academic load during the school year.

Northeastern University Alumni Club of Lowell Scholarships

The Northeastern University Alumni Club of Lowell awards scholarships annually to evening students in University College from the Greater Lowell area who demonstrate high scholastic ability and are in need of financial assistance. Students interested should obtain an application in the University College office, 102 Churchill Hall. Upon filing an application and submitting a resume, the student will be required to complete an interview with the Scholarship Committee of the Alumni Club of Lowell.

Pilot Freight Carriers Scholarships

Pilot Freight Carriers, Winston-Salem, North Carolina, awards \$500 annually to advanced transportation students who have achieved high academic standing and who have paid their tuition expenses without prior aid. The award may be shared by more than one student. Potential recipients are designated by the Director of the Transportation Institute, and a final determination is made by the Dean of University College.

University College Faculty Club Memorial Scholarship Awards

The Faculty Club of University College, Northeastern University, offers two awards annually, primarily for excellence in studies, to Bachelor of Science degree candidates in University College who have carried, and are currently carrying, a minimum of 24 quarter hours annually. Applications, available during the Winter Quarter, must be returned before the Spring Quarter.

These awards shall be known as University College Faculty Club Memorial Scholarship Awards in commemoration of the Club's deceased members.

U.S. Navy Field Training Supervisors Association Memorial Scholarship

A scholarship fund has been established by the generosity of the United States Navy Field Training Supervisors Association, in commemoration of the Association's deceased members. The Scholarship is awarded annually

to a deserving student, selected by the Committee on Scholarships, who is a Management major, working toward a Bachelor of Science degree in the evening program of University College.

Traffic Club of New England Scholarship

The Traffic Club of New England provides 12 basic and four advanced scholarships annually for persons employed in transportation and industry traffic departments. The scholarships are divided equally between industry and carrier applicants, and each award is applicable toward tuition, books, and incidental expenses involved in Transportation Management courses. The purpose of the plan is to afford a limited number of young men an opportunity to expand and improve their education by systematized study in courses in the field of transportation and traffic management. The scholarships are administered cooperatively with the Scholarship Committee of the Traffic Club of New England. Applications may be secured from and filed with the Secretary, The Traffic Club of New England, 294 Washington Street, Boston, Massachusetts 02108.

Sigma Epsilon Rho Scholarships

University College's scholastic honor society, Sigma Epsilon Rho, annually awards plaques and scholarships for outstanding scholastic achievement to the highest-ranking students in University and Lincoln Colleges at the end of their junior year.

Community Sources

Students and their families are urged to explore community, industrial, and foundation sources for collegiate financial aid. Parental employers or the appropriate union organization may be a source. In addition, local, civic, political, religious or educational leaders are often aware of aid sources in immediate community. Some typical sources may include: P.T.A., Kiwanis, Lions, Elks, Knights of Columbus, Masons, Sons of Italy, Rotary, State Rehabilitation, American Legion, etc.

University Grants

Each year Northeastern University grants a substantial number of full and partial tuition grants to students who have demonstrated both above-average scholastic achievement and financial need. All applications for aid are automatically considered for all grants administered by the University. It is not necessary for an applicant to specify the grant in which he is interested.

National Direct Student Loan

This program is available to students who are carrying at least one-half the normal academic workload, are accepted as degree candidates, and who show evidence of financial need.

The Federal maximum which a graduate student may borrow while pursuing his post-baccalaureate degree is \$5000.

Repayment and interest on these loans does not begin until nine months after the student ceases to carry at least a half-time academic load at an institution of higher education. The repayment of principal may be extended over a ten-year period with the interest at the rate of 3 percent per annum. Repayment may be deferred up to a total of three years while a borrower is serving as a Peace Corps or VISTA volunteer.

Guaranteed Student Loan Program

Under this program, students who are matriculated degree candidates, enrolled for at least one-half the normal academic work load, may borrow from a participating bank or other financial institution. Terms and conditions vary from state to state, but a student generally may borrow up to \$1,500 a year (the law allows a maximum of \$2,500 per year) depending on financial need. The federal government pays the interest while the student is in school if the student is eligible for interest subsidy.

The student must have submitted, through the College Scholarship Service, a Parents' Confidential Statement, or if he has been declared financially independent by the Financial Aid Office, a Students' Confidential Statement. These forms are available in the Financial Aid Office.

Applications for the loan itself are available from local banks or the Education Office of your state government. Additional information and necessary application forms for Massachusetts residents are available from the Financial Aid Office.

Veterans' Benefits

Any veteran covered by the Veterans Readjustment Act of 1966, Public Law 89-358, should report to Room 245 Richards Hall to fill out the proper enrollment forms. These forms will be made available during registration periods for all students in the Law Enforcement Programs at special off-campus locations.

Students needing additional information as to eligibility, allowances, or other details are urged to contact their local office of the Veterans Administration as early as possible.

Law Enforcement Assistance Administration

The Law Enforcement Assistance Administration, U.S. Department of Justice, has set up an Office of Academic Assistance under authority of the Omnibus Crime Control and Safe Streets Act of 1968, Public Law 90-351. Through the University, loans up to \$2200 per year for tuition and grants up to \$250 per academic quarter for tuition and fees are available to law enforcement personnel in undergraduate or graduate programs leading to degrees or certificates in areas directly related to law enforcement.

The loans, limited to full-time students in or preparing for law enforcement or corrections careers, are cancelled at the rate of 25 percent for each year the recipient subsequently serves in law enforcement at federal, state, or local level.

The grants are available to full-time or part-time students employed in a publicly-funded law enforcement agency, and involve a signed agreement to remain in the service of a law enforcement agency employing such applicant for two years following completion of the course for which aid was given.

Applications for loans or grants should be obtained from the Office of Financial Aid, Room 252 Richards Hall.

Sigma Epsilon Rho Honor Society Scholarship Award

The Sigma Epsilon Rho Society Scholarship Award, established in 1974 by the membership of the Society, is awarded annually to an undergraduate Student of University and/or Lincoln College at Northeastern University. Eligible students must have a cumulative Quality Point Average of 3.0 or better after completing 80 percent or more of their required studies.

Please note that aid granted from programs sponsored by the federal government are dependent upon the amount of funds allocated to Northeastern.

The University does not award financial assistance in any form to non-citizens of the United States.

student activities

Student activities for part-time students are planned, organized, and operated by the student body with the assistance of the Director of University-Lincoln College Student Activities. The programs are designed to keep pace with the changing needs of adult students and to provide maximum opportunity for student participation. All part-time students in University College and Lincoln College are welcome to participate.

The program is flexible in nature and pioneering in spirit to meet the needs of adult students. The Office of University-Lincoln College Student Activities is particularly interested in developing new clubs which will benefit students professionally and educationally. If students wish to start clubs related to their professions, this office will help them plan and organize clubs on the local and national level. The program is dedicated to assisting the adult student in the development of his fullest potential. The University-Lincoln College Student Activities Office is located in 102 Churchill Hall.

Purpose

The purposes of part-time student activities are:

To provide opportunities for the development and pursuit of cultural interests and professional objectives.

To encourage the development of leadership activities and skills.

To enable the student to identify more closely with the University.

To include the family, as an important and vital motivating force, in the part-time student's educational career.

Sigma Epsilon Rho Honor Society

Sigma Epsilon Rho is the honor society of University College. Its purposes are:

To promote acquaintance and good fellowship among those students who have attained highest scholastic standing in the College.

To stimulate the student body to higher scholastic accomplishment through the bearing, influence, and work of these selected men and women.

To develop methods of mutual improvement and advancement among members.

To support high moral, professional, and scholastic ideals.

Only honor graduates or seniors with honor standing at the end of the junior year are eligible for admission to the society. Admission is by invitation after nomination by the society.

An outstanding book is awarded each year by Sigma Epsilon Rho Society to the highest-ranking student at the conclusion of the junior year. Students will receive the award only in the event that they enroll for the subsequent year.

Kappa Tau Phi Sorority

Kappa Tau Phi Sorority is a social organization open to all part-time women students. Its purpose is to promote fellowship among the women students so that they may become better acquainted and form a closer tie with the University. Two scholarships are awarded annually to scholastically superior women students.

Lambda Alpha Epsilon

Lambda Alpha Epsilon is a national law enforcement fraternity founded in 1957. The Northeastern Chapter Kappa Phi Beta is open to part-time and day students enrolled in Law Enforcement and Security Programs, and also to professional men in the fields of law enforcement and security. The fraternity is dedicated to the furtherance of professional standards in law enforcement.

Pi Tau Kappa Fraternity

Pi Tau Kappa is a social fraternity open to all evening students. It is organized to enhance their social welfare and promote closer affiliation with the University.

Evening Student Council

The Evening Student Council was formed to provide a representative body to promote the welfare of the student body in non-academic areas and to foster extracurricular activities which will enrich University life. It affords participants opportunities to meet and develop close personal relationships with fellow students and the administrative staff.

The Evening Student Council provides students with opportunities to develop leadership skills and gives them a chance to discuss matters of professional interest with experts in their chosen field.

The Council is made up of interested students in University and Lincoln College, representatives of part-time interest groups, and those specially

certified by the Council because of their demonstrated interest in the overall adult programs of the University.

The E.S.C., a member of the United States Association of Evening Students, meets evenings on a monthly basis in the Student Center. Students are welcome to visit, observe, and express opinions concerning part-time student life. Free refreshments are served at all meetings.

Use of Gymnasium Facilities

Specific schedules for use of the Pool, Weight Training Room, Indoor Athletic Field and Track, Handball Courts, Gymnasium, and Wrestling Room are set up each quarter for use by all part-time students. In order to become eligible, students must obtain a temporary Gymnasium Pass each time they wish to use the Cabot Gymnasium Complex. Passes are available in the Cabot Complex, Monday through Friday from 4:30 p.m. to 9:00 p.m. and on Saturday and Sunday from 1:00 p.m. to 4:00 p.m. All students requesting a pass must present their Student Identification Card prior to receiving a pass. Passes are issued on a first-come, first-served basis. Students using the Cabot Gymnasium Complex are required to abide by all the Rules of the Gym and may be asked to complete a Medical Release form.

Evening Ski Club

The Evening Ski Club was established as a special interest club by students in University and Lincoln College to give skiers an opportunity to meet other skiers for the purpose of promoting the sport and its related activities. Events sponsored by the Evening Ski Club include wine and cheese parties held locally and in the various ski areas of Maine, New Hampshire, and Vermont. A summer clambake is also arranged on a local beach, usually in July or August. Meetings are held from October through April on a bi-weekly basis on the main campus. Students interested should contact the Evening Student Activities Office in 102 Churchill Hall.

Alumni Association

More than 52,000 alumni are members of the all-University Alumni Association which has as its prime purposes the promotion of the welfare of Northeastern University, the establishment of a mutually beneficial relationship between the University and its alumni, and the perpetuation of fellowship among members of the Association.

The Alumni Relations office is located in Room 101, Ell Student Center. The official records and addresses of alumni are maintained in Room 260, United Realty Building.

Activities of the Association, including the Homecoming Day celebration and the annual presentation of Professional Promise Awards to outstanding seniors in Lincoln and University Colleges, are directed by the Vice Presi-

dent for Alumni Affairs. Alumni officers also attend meetings of the undergraduate classes to form a closer relationship between the Association and its future members.

The Alumni Relations Office assists the various class officers in planning class reunions. Each class normally holds a reunion every five years during the month of June. The Vice President for the Alumni Class Council is responsible for coordinating class activities and organizing class functions.

The Vice President for Alumni Clubs works in close association with officers of the more than 50 Regional Alumni Clubs which have been established from coast to coast. All alumni are eligible to become members of these organizations. The alumni clubs meet periodically, often in conjunction with visits from members of the faculty or with athletic events.

For Boston area alumni, monthly luncheon meetings are held in both the downtown and uptown sections of the city.

The Association also sponsors and assists the Alumnae Organization and the Varsity Club, both of which have their own officers and conduct various programs throughout the year. Through the Varsity Club, the Association presents trophies to the outstanding athlete of the year in each of the five major sports.

One of the most recent developments in alumni activities is the organization of seminars which are conducted by the Association in cooperation with the University's Center for Continuing Education. The seminars are designed particularly for alumni who have a special interest in current events and the field of adult education.

The Northeastern University Alumni Association is a member of the American Alumni Council, a professional organization composed of representatives of all major colleges and universities in the United States and Canada.

Alumni Relations

The Alumni Association is providing a uniquely valuable service to both the University and the community by sponsoring admissions conferences for parents of high school students who are interested in attending college. These meetings, held in cooperation with the Northeastern Department of Admissions, have been extremely well attended. Local residents as well as Alumni of the University have been invited to these conferences which help to clarify many of the questions today's parents and young people have concerning application procedures of colleges and universities.

programs of study

University College conducts part-time educational programs at the undergraduate level during day and evening hours. The programs are designed to meet the varying needs and interests of adult students who may enroll as (1) Regular students following degree programs or as (2) Special students taking single courses or special programs.

University College programs leading to the Bachelor of Science and Bachelor of Arts degrees provide opportunities for cultural and professional development equivalent in quality and scope to those offered in the conventional four-year college enrolling full-time students. The bachelor's degree requires 74 quarter hours of credit.

Programs leading to the Associate in Science degree provide students a background in fundamental areas in business administration, liberal arts, health professions, therapeutic recreation services, and law enforcement. The Associate degree requires 96 quarter hours of credit and is equivalent to the conventional two-year or junior college in scope and quality.

Degree curricula are offered in the following areas:

BUSINESS ADMINISTRATION

Major	Degree	Page
Business Administration	Associate in Science	56
Electronic Data Processing	Associate in Science	58
Purchasing	Associate in Science	60
Real Estate	Associate in Science	62
Accounting	Bachelor of Science	64
Finance	Bachelor of Science	65
Industrial Management	Bachelor of Science	67
Industrial Technology	Bachelor of Science	68
Insurance	Bachelor of Science	69
Management	Bachelor of Science	70
Management Information Systems	Bachelor of Science	71
Marketing	Bachelor of Science	73
Personnel and Industrial Relations	Bachelor of Science	74
Transportation and Physical Distribution	Bachelor of Science	75
Management	Bachelor of Science	75
Combined Program in Liberal Arts and Management	Bachelor of Science	77

LIBERAL ARTS

Major	Degree	Page
Economics	Bachelor of Arts	83
English	Bachelor of Arts, Bachelor of Science	84
Fine Arts	Bachelor of Arts, Bachelor of Science	85
History	Bachelor of Arts	87
Liberal Arts	Associate in Science	88
Music	Bachelor of Arts, Bachelor of Science	97
Political Science	Bachelor of Arts	89
Psychology	Bachelor of Arts	92
Sociology-Anthropology	Bachelor of Arts, Bachelor of Science	94
Chemical-Biological Technology	Associate in Science	99
Chemical-Biological Technology	Bachelor of Science	100

LAW ENFORCEMENT

Major	Degree	Page
Correctional Practices	Bachelor of Science	104
	Associate in Science	108
Law Enforcement	Bachelor of Science	110
	Associate in Science	114
Security	Bachelor of Science	116
	Associate in Science	120

HEALTH PROFESSION PROGRAMS

Major	Degree	Page
Health Science	Bachelor of Science	124
Management in Health Agencies and Institutions	Bachelor of Science	126
Medical Laboratory Science Cytotechnology	Bachelor of Science	137
	Associate in Science	137
Medical Technology	Bachelor of Science	140
	Associate in Science	140
Medical Record Administration	Bachelor of Science	130
	Certificate	132
Nursing Home Administration Radiologic Technology	Certificate	128
Respiratory Therapy	Associate in Science	143
Medical Laboratory Science Hematology	Associate in Science	134
	Bachelor of Science	145

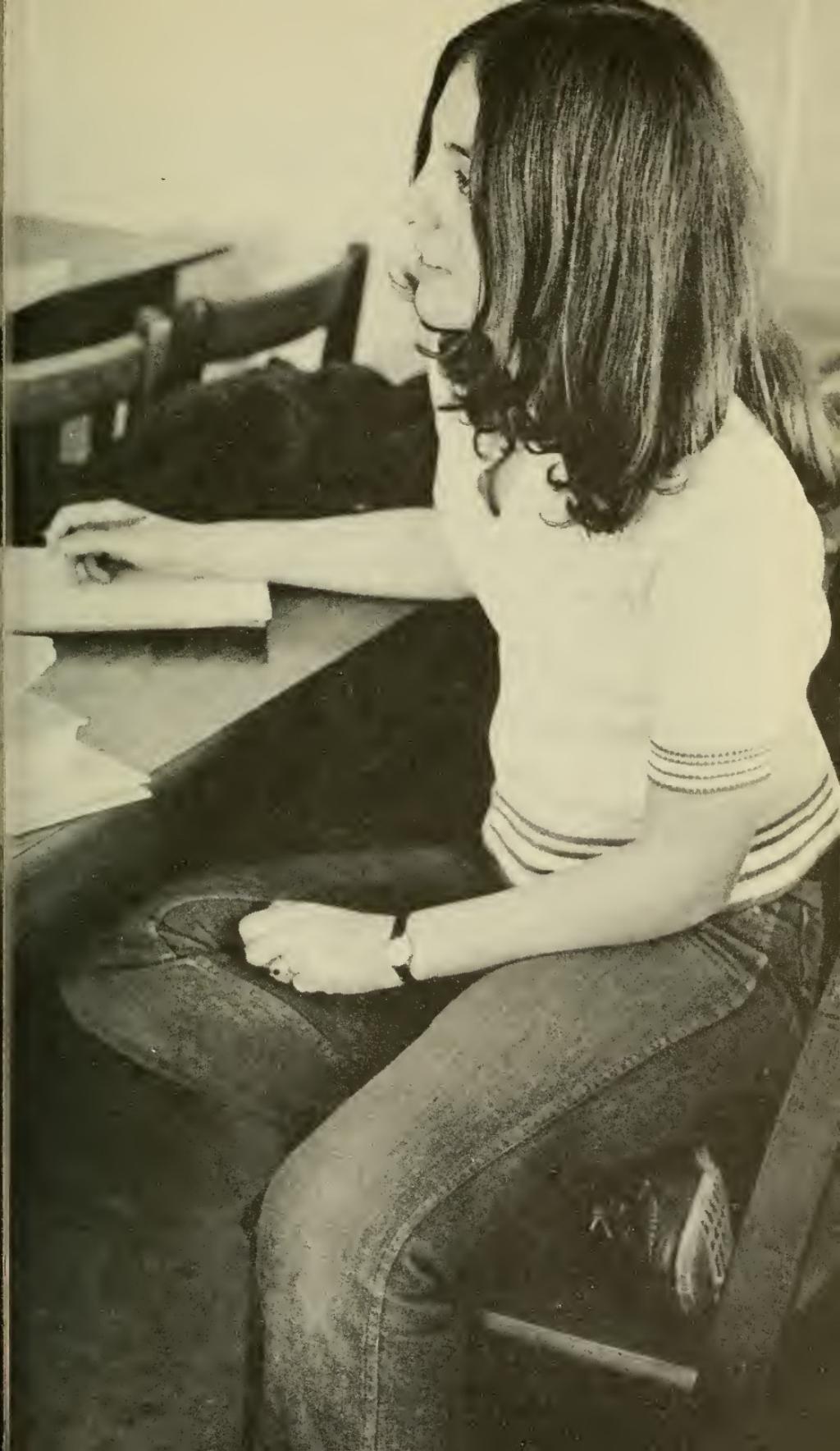
EDUCATION

Major	Degree	Page
Teaching of English (in grades 7-12)	Bachelor of Science	150

Course descriptions are listed in numerical order by department beginning on page 151.

THERAPEUTIC RECREATION SERVICES

Major	Degree	Page
Therapeutic Recreation Services	Certificate	153
	Associate in Science	153



business administration

Paul D. Maxwell, Assistant Dean

**Director, Business Administration Programs
Telephone 437-2418**

Aims

Business Administration programs of study are offered to meet the needs of adult men and women wishing to acquire a college education on a part-time basis. The opportunity to achieve professional competence in a chosen field, while developing potential for further managerial growth, is one of the program's principal objectives. Degree programs are designed to create both a breadth of perspective and a degree of specialization. Breadth of perspective will be obtained through exposure to a well-balanced sequence of liberal arts courses, which emphasize fundamental economic laws, and the social and cultural foundations of our changing American society. Specialized knowledge for future managerial growth will be acquired through the study of basic business courses, in addition to a self-determined study of a major business area.

Requirements

Associate in Science Degree

The Associate in Science degree is offered in the following fields of study: Business Administration, Electronic Data Processing, Purchasing, and Real Estate. To qualify for the associate degree 96 quarter hours must be successfully completed in one of the four associate programs. Detailed information on these programs together with a recommended sequence for completing them appears on the following pages.

New Students—Please Note:

In an effort to achieve a certain level of analytic and academic sophistication among students taking upper level business administration courses (designated by an asterisk wherever they appear in the catalog), University College instituted a new procedure in the Fall Quarter of 1969 whereby all new students are required to successfully complete an appropriate associate degree program before they become eligible to take upper level business administration courses. Special students (students not pursuing a degree program) may take upper level courses if they can demonstrate to a program adviser (always present during registration) or to one of the deans in University College that they have an adequate background to cope with

upper level course content. In determining whether a student has "an adequate background," the program advisers and the deans will evaluate, but not be limited to, such factors as work experience, former college work, independent study, etc.

The "appropriate" program for all bachelor degree students, except the Management Information Systems (MIS) degree student, is the Associate degree program in Business Administration. The "appropriate" program for the MIS degree student is the Associate degree program in Electronic Data Processing (EDP). Students pursuing one of the other associate programs or students pursuing an "inappropriate" associate program (e.g., student following EDP associate program who wants to major in finance in his bachelor's program) may make special arrangements with the Dean of Admissions or the Director of Business Programs for a bachelor's program.

A student with a 2.0 average or better in an Associate degree program will be considered by University College as having "successfully completed" the program. It should be noted that students do not have to formally receive Associate degrees; successful completion of the Associate degree program (or demonstration of an "adequate background" in the case of special students) is all that is necessary for entry into upper level business administration courses.

The Bachelor of Science Degree

The Bachelor of Science degree in Business Administration is offered in the following fields of study: Accounting, Finance, Industrial Management, Industrial Technology, Insurance, Management, Management Information Systems, Marketing, Personnel, and Industrial Relations, Transportation and Physical Distribution Management, and in the Combined Program in Liberal Arts and Management.

In general, the Bachelor of Science degree requires successful completion of the following areas of study:

Liberal Arts	quarter hours
Basic Courses and Electives	70
Business Administration	
Basic courses	66
Major Field of Study	30
Electives (Business Administration or Liberal Arts)	8
Total	174

Detailed information on these programs appears on the following pages.

English Requirements

The English requirements shall be fulfilled by taking Composition and Rhetoric I, II (30.601, 30.602), Introduction to Literary Forms I, II (30.604, 30.605) and four additional hours of literature. Please review the appropriate detailed program information. For new English requirements see explanation on page 209.

BUSINESS ADMINISTRATION**Associate in Science Degree**

quarter hours

Basic Courses—Liberal Arts

10.327,	10.328,	10.329	Mathematics I, II, III	6
16.501,	16.502,	16.503	Earth Science I, II, III	6
19.501,	19.502,	19.503	Psychology I, II, III	6
23.501,	23.502,	23.503	Western Civilization I, II, III	6
	30.601,	30.602	Composition and Rhetoric I, II	4
	30.604,	30.605	Introduction to Literary Forms I, II	4
39.501,	39.502,	39.503	Economic Principles & Problems I, II, III	6
39.511,	39.512,	39.513	Statistics I, II, III	6
				44

Basic Courses—Business Administration

41.501,	41.502,	41.503	Accounting Principles I, II, III	6
43.501,	43.502,	43.503	Introduction to Marketing I, II, III	6
44.501,	44.502,	44.503	Finance & Risk Management I, II, III	6
45.506,	45.507,	45.508	Production Management and Manufacturing Systems I, II, III	6
45.501,	45.502,	45.503	Management & Organization I, II, III	6
	45.511,	45.512	Human Relations in Organizations I, II	4
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6
		45.599	Basic Computer Programming	2
45.610,	45.611	45.611	Labor Management Relations I, II	4
		45.667	Project Planning and Control	2
				48

Electives**Literature**

4

Total Credits

96

Students following a degree program should refer to suggested course sequence on the opposite page.

The following courses are frequently offered as single quarter intensives during the regular school year. Please refer to the current Schedule of Courses and Registration Guide for details.

19.508,	19.509	Fundamentals of Psychology I, II	8*
23.509,	23.510	Western Civilization A, B	6
	30.603	Composition and Rhetoric	4
	30.606	Introduction to Literary Forms	4
41.541		Accounting Principles	6
43.504		Introduction to Marketing	6
44.504		Finance & Risk Management	6
45.641		Human Relations In Organization	4
45.642		Production Management and Manufacturing Systems	6
45.648		Electronic Data Processing	6
45.652		Management and Organization	6
45.690		Labor Management Relations	4

*Additional 2 quarter hours of credit may be applied to Liberal Arts Electives in B.S. degree programs.

BUSINESS ADMINISTRATION**Recommended Course Sequence for the 4-Year Program
Leading to the Associate in Science Degree**

	Quarter I	Quarter II	Quarter III
1st Year	Comp. & Rhet. I Accounting I Mgmt. & Org. I Earth Science I	Comp. & Rhet. II Accounting II Mgmt. & Org. II Earth Science II	Elective Accounting III Mgmt. & Org. III Earth Science III
2nd Year	Economics I Math. I Marketing I Fin. & Risk I	Economics II Math. II Marketing II Fin. & Risk II	Economics III Math. III Marketing III Fin. & Risk III
3rd Year	West. Civ. I Psych. I E.D.P. I Labor Mgmt. I	West. Civ. II Psych. II E.D.P. II Labor Mgmt. II	West. Civ. III Psych. III E.D.P. III Elective
4th Year	Intro. Lit. Forms I Stat. I Prodn. Mgmt. I Basic Computer Programming	Intro. Lit. Forms II Stat. II Prodn. Mgmt. II Hum. Rel. I	Project Planning Stat. III Prodn. Mgmt. III Hum. Rel. II

ELECTRONIC DATA PROCESSING**Associate in Science Degree**

quarter hours

Basic Courses—Liberal Arts

10.327,	10.328,	10.329	Mathematics I, II, III	6
16.501,	16.502,	16.503	Earth Science I, II, III	6
19.501,	19.502,	19.503	Psychology I, II, III	6
29.501,	29.502,	29.503	Effective Speaking I, II, III	6
	30.601,	30.602	Composition and Rhetoric I, II	4
	30.604,	30.605	Introduction to Literary Forms I, II	4
39.501,	39.502,	39.503	Economic Principles & Problems I, II, III	6
39.511,	39.512,	39.513	Statistics I, II, III	6
				44

Basic Courses—Business Administration

41.501,	41.502,	41.503	Accounting Principles I, II, III	6
44.501,	44.502,	44.503	Finance & Risk Management I, II, III	6
45.501,	45.502,	45.503	Management and Organization I, II, III	6
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6
				24

Major Field of Study

10.332,	10.333,	10.334	Mathematics for Business Management I, II, III	6
45.573,	45.574,	45.575	Computer Programming for Business I, II, III	6
		45.577	Data Systems Administration	2
45.578,	45.579		Business Data Processing Applications I, II	4
		45.667	Project Planning and Control	2
45.586,	45.587,	45.588	Systems Design and Techniques I, II, III	6
				26

Electives**Liberal Arts**

2

2**Total Credits****96**

Students following a degree program should refer to suggested course sequence on the opposite page.

The following courses are frequently offered as single quarter intensives during the regular school year. Please refer to the current Schedule of Courses and Registration Guide for details.

19.508,	19.509	Fundamentals of Psychology I, II	8*
	30.603	Composition and Rhetoric	4
	30.606	Introduction to Literary Forms	4
	41.541	Accounting Principles	6
	44.504	Finance and Risk Management	6
	45.644	Computer Programming for Business	6
	45.648	Electronic Data Processing	6
	45.652	Management and Organization	6
	45.689	Systems Design and Techniques	6

*Additional 2 quarter hours of credit may be applied to Liberal Arts electives.

ELECTRONIC DATA PROCESSING**Recommended Course Sequence for the 4-Year Program
Leading to the Associate in Science Degree**

	Quarter I	Quarter II	Quarter III
1st Year	Comp. & Rhet. I E.D.P. I Mgmt. & Org. I Math. I	Comp. & Rhet. II E.D.P. II Mgmt. & Org. II Math. II	Elective E.D.P. III Mgmt. & Org. III Math. III
2nd Year	Economics I Accounting I Math. for Bus. Mgmt. I Comp. Prog. Bus. I	Economics II Accounting II Math. for Bus. Mgmt. II Comp. Prog. Bus. II	Economics III Accounting III Math. for Bus. Mgmt. III Comp. Prog. Bus. III
3rd year	Fin. & Risk I Psych. I Sys. Des. Tech. I Stat. I	Fin. & Risk II Psych. II Sys. Des. Tech. II Stat. II	Fin. & Risk III Psych. III Sys. Des. Tech. III Stat. III
4th year	Intro. to Lit. Forms I Effective Spkng. I Data Sys. Adm. Earth Science I	Intro. to Lit. Forms II Effective Spkng. II Bus. Data Proc. Appl. I Earth Science II	Project Planning Effective Spkng. III Bus. Data Proc. Appl. II Earth Science III

PURCHASING**Associate in Science Degree****Basic Courses—Liberal Arts**

				quarter hours
10.327,	10.328,	10.329	Mathematics I, II, III	6
19.501,	19.502,	19.503	Psychology I, II, III	6
	30.601,	30.602	Composition and Rhetoric I, II	4
	30.604,	30.605	Introduction to Literary Forms I, II	4
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6
39.511,	39.512,	39.513	Statistics I, II, III	6
				32

Basic Courses—Business Administration

41.501,	41.502,	41.503	Accounting Principles I, II, III	6
44.501,	44.502,	44.503	Finance and Risk Management I, II, III	6
45.501,	45.502,	45.503	Management and Organization I, II, III	6
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6
				24

Major Field of Study

	43.520	Industrial Marketing	2	
	45.510,	45.611	Labor Management Relations I, II	4
	45.511,	45.512	Human Relations in Organizations I, II	4
		45.536	Principles of Material Inspection	2
45.537,	45.538,	45.539	Purchasing I, II, III	6
45.541,	45.542,	45.543	Law I, II, III*	6
45.623,	45.624,	45.625	Manufacturing Processes I, II, III	6
	45.627,	45.628	Value Management, I, II,	4
		45.626	Professional Purchasing Techniques*	2
Electives		Literature	4	
			4	

Total Credits**96**

Students following a degree program should refer to suggested course sequence on the opposite page.

Additional Departmental Offerings

45.666	Materials Acquisition Function	2
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Please see page 242 for course descriptions.

The following courses are frequently offered as single quarter intensives during the regular school year. Please refer to the current Schedule of Courses and Registration Guide for details.

			quarter hours
19.508,	19.509	Fund of Psych. I, II	8**
	30.603	Composition and Rhetoric	4
	30.606	Introduction to Literary Forms	4
	41.541	Accounting Principles	6
	44.504	Finance and Risk Management	6
	45.641	Human Relations In Organization	4
	45.648	Electronic Data Processing	6
	45.652	Management and Organization	6
	45.690	Labor Management Relations	4

*Upper level Business Administration course; may be taken in the Purchasing Associate Degree Program.

**Additional 2 quarter hours of credit may be applied to Liberal Arts electives in B.S. degree programs.

PURCHASING**Recommended Course Sequence for the 4-Year Program
Leading to the Associate-in Science Degree**

	Quarter I	Quarter II	Quarter III
1st Year	Comp. & Rhet. I Accounting I Mgmt. & Org. I Math. I	Comp. & Rhet. II Accounting II Mgmt. & Org. II Math. II	Elective Accounting III Mgmt. & Org. III Math. III
2nd year	Economics I Psych. I Fin. & Risk I E.D.P. I	Economics II Psych. II Fin. & Risk II E.D.P. II	Economics III Psych. III Fin. & Risk III E.D.P. III
3rd year	Intro. to Lit. Forms I Stat. I Purchasing I Manuf. Proc. I	Intro. to Lit. Forms II Stat. II Purchasing II Manuf. Proc. II	Elective Stat. III Purchasing III Manuf. Proc. III
4th year	Law I Labor Mgmt. Rel. I Hum. Rel. I Value Mgmt. I	Law II Labor Mgmt. Rel. II Hum. Rel. II Value Mgmt. II	Law III Industrial Mktg. Prin. Mat. Inspec. Prof. Purchasing

REAL ESTATE**Associate in Science Degree**

Basic Courses—Liberal Arts				quarter hours
10.327,	10.328,	10.329	Mathematics I, II, III	6
19.501,	19.502,	19.503	Psychology I, II, III	6
23.501,	23.502,	24.503	Western Civilization I, II, III	6
	30.601,	30.602	Composition and Rhetoric I, II	4
	30.604,	30.605	Introduction to Literary Forms I, II	4
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6
39.511,	39.512,	39.513	Statistics I, II, III	6
				38
Basic Courses—Business Administration				—
41.501,	41.502,	41.503	Accounting Principles I, II, III	6
44.501,	44.502,	44.503	Finance and Risk Management I, II, III	6
45.501,	45.502,	45.503	Management and Organization I, II, III	6
45.541,	45.542,	45.543	Law I, II, III*	6
				24
Major Field of Study				—
47.501,	47.502,	47.503	Real Estate Fundamentals I, II, III	6
	47.508,	47.509	Real Estate Financial Analysis I, II	4
		47.511	Fundamental Real Estate Appraisal	2
	47.512,	47.513	Advanced Real Estate Appraisal I, II	4
		47.521	Real Estate Development	2
				18
Electives				—
		Literature		4
		Liberal Arts		6
		Business Administration		6
				16
Total Credits				96

Students following a degree program should refer to the suggested course sequence on the opposite page.

Additional Department Offerings

45.586,	45.587,	45.588	Systems Design and Techniques I, II, III	6
		47.524	Private Real Estate Law	2
47.525,	47.526		Public Real Estate Law I & II	4
	47.527		Housing	2
47.528,	47.529,	47.530	Real Estate Management I, II, III	6

Please see page 255 for course descriptions.

The following courses are frequently offered as single quarter intensives during the regular school year. Please refer to the current Schedule of Courses and Registration Guide for details.

				quarter hour:
19.508,	19.509	Fundamentals of Psychology I, II		8**
23.509,	23.510	Western Civilization A, B		6
	30.603	Composition and Rhetoric		4
	30.606	Introduction to Literary Forms		4
	41.541	Accounting Principles		6
	44.504	Finance and Risk Management		6
	45.652	Management and Organization		6

*Upper level Business Administration course; may be taken in the Real Estate Associate Degree program.

**Additional 2 quarter hours of credit may be applied to Liberal Arts electives.

REAL ESTATE**Recommended Course Sequence for the 4-Year Program
leading to the Associate in Science Degree**

	Quarter I	Quarter II	Quarter III
st ear	Comp. & Rhet. I	Comp. & Rhet. II	Elective
	Accounting I	Accounting II	Accounting III
	Mgmt. & Org. I	Mgmt. & Org. II	Mgmt. & Org. III
	Math. I	Math. II	Math. III
nd ear	Economics I	Economics II	Economics III
	Law I	Law II	Law III
	Fin. & Risk I	Fin. & Risk II	Fin. & Risk III
	R.E. Fund. I	R.E. Fund. II	R.E. Fund. III
rd ear	Psych. I	Psych. II	Psych. III
	Stat. I	Stat. II	Stat. III
	R.E. Fin. Anal. I	R.E. Fin. Anal. II	R.E. Development
	Elective	Elective	Elective
th ear	Intro. to Lit. Forms I	Intro. to Lit. Forms II	Elective
	Fund. R.E. App.	Adv. R.E. App. I	Adv. R.E. App. II
	Elective	Elective	Elective
	Elective	Elective	Elective

ACCOUNTING**Bachelor of Science Degree**

quarter hours

Associate Degree Program**Core Courses—Liberal Arts**

21.501, 21.502, 21.503	Sociology I, II, III	6	96
26.501, 26.502, 26.503	Introduction to Philosophy I, II, III	6	12

Core Courses—Business Administration

41.504, 41.505, 41.506	Accounting—Intermediate I, II, III	6	24
41.507, 41.508, 41.509	Accounting—Cost I, II, III	6	
44.507, 44.508, 44.509	Corporate Finance I, II, III	6	
45.541, 45.542, 45.543	Law I, II, III*	6	

Major Concentration Courses

41.510, 41.511, 41.512	Accounting—Advanced I, II, III*	6	
41.513, 41.514, 41.515	Accounting—Specialized Problems I, II, III*	6	
41.516, 41.517, 41.518	Auditing I, II, III*	6	
41.519, 41.520, 41.521	Federal Income Taxes I, II, III*	6	
41.522, 41.523, 41.524	Seminar in Contemporary Accounting Problems I, II, III*	6	30

Electives

Liberal Arts	10	
Business Administration or Liberal Arts	2	12

Total Credits

174

Additional Department Offerings

41.525	Estate and Gift Taxes	2	
41.526, 41.527	Corporate and Stockholder Tax Problems I, II	4	
41.528	Tax Factors in Business Decisions	2	
45.586, 45.587, 45.588	Systems Design and Techniques I, II, III	6	
45.618, 45.619	Retail Data Processing Applications I, II	4	
45.655, 45.656	Auditing Data Processing Applications I, II	4	
45.661, 45.662	Banking Data Processing Applications I, II	4	

Please see page 226 for course descriptions.

The following courses are frequently offered as single quarter intensives during the regular school year. Please refer to the current Schedule of Courses and Registration Guide for details.

quarter hour

21.601, 21.602	Principles of Sociology I, II	8**	
44.505	Corporate Finance	6	

*Upper level Business Administration course—see p. 54.

**Additional 2 quarter hours of credit may be applied to Liberal Arts electives.

FINANCE

Bachelor of Science Degree

quarter hours

96

Associate Degree Program

21.501,	21.502,	21.503	Sociology I, II, III	6
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6
	39.517,	39.518	Money and Banking I, II	4
		39.519	Public Finance	2

Core Courses—Business Administration

41.504,	41.505,	41.506	Accounting—Intermediate I, II, III	6
44.507,	44.508,	44.509	Corporate Finance I, II, III	6
44.521,	44.522,	44.523	Credit Management I, II, III*	6
45.541,	45.542,	45.543	Law I, II, III*	6 24

Major Concentration Courses—Students Specializing in Savings Banking and Real Estate:

	39.561	Urban Economics	2	
	44.513	Estate Planning*	2	
44.517, 44.518,	44.519	Investments I, II, III*	6	
	44.544	Law of Finance*	2	
47.501, 47.502,	47.503	Real Estate Fundamentals I, II, III	6	
	47.508,	47.509	Real Estate Financial Analysis I, II	4
	47.511	Real Estate Appraisal	2	
			24	

Electives

Liberal Arts	4
Business Administration or Liberal Arts	8
Total Credits	174

Major Concentration Courses—Students Specializing in Commercial Banking:

	44.513	Estate Planning*	2
I4.517,	44.518,	44.519 Investments I, II, III*	6
	44.531,	44.532 Seminar in Finance I, II*	4
	44.533,	44.534 International Finance I, II*	4
		44.544 Law of Finance*	2
I7.501,	47.502,	47.503 Real Estate Fundamentals I, II, III	6 24

Electives

Liberal Arts	4
Business Administration or Liberal Arts	8
Total Credits	174

Major Concentration Courses—Students Specializing in Corporate Finance:

41.507,	41.508,	41.509	Cost Accounting I, II, III	6
		41.528	Tax Factors in Decision Making	2
44.517,	44.418,	44.519	Investments I, II, III*	6
	44.531,	44.532	Seminar in Finance I, II*	4
44.533,	44.534	44.534	International Finance I, II*	4
		44.544	Law of Finance*	2
				24

Electives

Liberal Arts	4
Business Administration or Liberal Arts	8
	12

Total Credits**Major Concentration Courses—Students Specializing in International Finance:**

39.523,	39.524,	39.525	Government and Business I, II, III	6
	39.528,	39.529	International Economics I, II	4
		39.571	European Economic History	2
44.517,	44.518,	44.519	Investments I, II, III*	6
	44.531,	44.532	Seminar in Finance I, II*	4
44.533,	44.534	44.534	International Finance I, II*	4
		44.544	Law of Finance*	2
				28

Electives

Liberal Arts	4
Business Administration or Liberal Arts	4
	8

Total Credits

The following courses are frequently offered as single quarter intensives during the regular school year. Please refer to the current Schedule of Courses and Registration Guide for details.

			quarter hours
21.601,	21.602	Principles of Sociology I, II	8**
	44.505	Corporate Finance	6
	44.535	Investments	6

Additional Department Offerings

44.545,	44.546	Profit Planning and Control I, II	4
	44.547	Advanced Financial Problems	2
	44.548	Capital Strategy	2
45.586,	45.587,	45.588	Systems Design and Techniques I, II, III
	45.616,	45.653	Government Data Processing
			Applications I, II
	45.655,	45.656	Auditing Data Processing Applications I, II
	45.661,	45.662	Banking Data Processing Applications I, II
	45.664,	45.665	EDP in Property and Casualty I, II
			4

Please see page 232 for course descriptions.

*Upper level Business Administration course—see p. 54.

**Additional 2 quarter hours of credit may be applied to Liberal Arts electives.

INDUSTRIAL MANAGEMENT**Bachelor of Science Degree**

			quarter hours
Associate Degree Program			96
Core Courses—Liberal Arts			
10.332, 10.333, 10.334	Mathematics for Business Management I, II, III	6	
16.511, 16.512, 16.513	History of Science and Technology I, II, III	6	
19.532, 19.533, 19.534	Industrial Psychology I, II, III	6	
39.523, 39.524, 39.525	Government and Business I, II, III	6	24
			<hr/>
Core Courses—Business Administration			
45.541, 45.542, 45.543	Law I, II, III*	6	
45.670, 45.671, 45.672	Management of Change I, II, III	6	12
			<hr/>
Major Concentration Courses			
45.533, 45.534, 45.535	Management Decisions and Policies I, II, III	6	
45.561, 45.562	Statistical Quality Control I, II	4	
45.563	Management of Quality Control	2	
45.595, 45.596, 45.597	Manufacturing Seminar I, II, III*	6	
45.623, 45.624, 45.625	Manufacturing Processes I, II, III	6	
45.636, 45.637	Production and Inventory Control I, II	4	
45.638, 45.639, 45.640	Industrial Decision Making I, II, III*	6	
45.695	Materials Management	2	36
Electives	(Liberal Arts or Business Administration)		6
			<hr/>
	Total Credits		174

Additional Department Offerings

45.519	Work Methods	2
45.528	Work Measurement	2
45.522	Job Evaluation	2
45.526, 45.431	Facilities Planning and Design I, II	4
45.530	Standard Data Development	2
45.577	Data Systems Administration	2
45.586, 45.587, 45.588	Systems Design and Techniques I, II, III	6
45.620	Industrial Safety	2
45.626	Professional Purchasing Techniques	2
45.627, 45.628	Value Management I, II	4
45.685, 45.686, 45.687	Computer Programming for Scientific Applications I, II, III	6
45.696	Principles and Practice of Management	2

Please see page 239 for course descriptions.

The following courses are frequently offered as single quarter intensives during the regular school year. Please refer to the current Schedule of Courses and Registration Guide for details.

		quarter hours
45.608	Quality Control	4
45.680	Production and Inventory Control	4

*Upper level Business Administration course—see p. 54.

*Additional 2 quarter hours of credit may be applied to Liberal Arts electives.

INDUSTRIAL TECHNOLOGY**Bachelor of Science Degree**

quarter hours

Engineering or Science Technology Courses

96

Core Courses—Liberal Arts

19.501,	19.502,	19.503	Psychology I, II, III	6
21.501,	21.502,	21.503	Sociology I, II, III	6
23.501,	23.502,	23.503	Western Civilization I, II, III	6
	30.601,	30.602	Composition and Rhetoric I, II	4
	30.604,	30.605	Introduction to Literary Forms I, II	4
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6
				32

Core Courses—Business Administration

41.501,	41.502,	41.503	Accounting Principles I, II, III	6
	43.514,	43.515	Marketing Fundamentals I, II**	4
45.501,	45.502,	45.503	Management and Organization I, II, III	6
45.541,	45.542,	45.543	Law I, II, III*	6
	45.561,	45.562	Statistical Quality Control I, II	4
		45.563	Management of Quality Control	2
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6
	45.610,	45.611	Labor-Management Relations I, II	4
	45.673,	45.674	Industrial Processes I, II**	4
				42

Electives**Literature**

4

4

Total Credits

174

The following courses are frequently offered as single quarter intensives during the regular school year. Please refer to the current Schedule of Courses and Registration Guide for details.

				quarter hours
23.509,	23.510	Western Civ. A, B		6
30.603		Composition & Rhetoric		4
30.606		Introduction to Literary Forms		4
41.541		Accounting Principles		6
45.652		Management and Organization		6
45.690		Labor Management Relations		4
45.608		Quality Control		6
45.648		Electronic Data Processing		6

*Upper level Business Administration course—see p. 54.

**Course substitutions may not be effected.

INSURANCE**Bachelor of Science Degree**

			quarter hours
Associate Degree Program			96
Core Courses—Liberal Arts			
21.501, 21.502, 21.503	Sociology I, II, III	6	
26.501, 26.502, 26.503	Introduction to Philosophy I, II, III	6	
39.517, 39.518	Money and Banking I, II	4	
39.519	Public Finance	2	18
			—
Core Courses—Business Administration			
44.511, 44.512	Life Insurance I, II	4	
44.514, 44.515, 44.516	Property and Casualty Insurance I, II, III	6	
45.541, 45.542, 45.543	Law I, II, III*	6	16
			—
Major Concentration Courses			
44.513	Estate Planning*	2	
44.525, 44.526	Health and Social Insurance I, II*	4	
44.527	Group Insurance and Pensions	2	
44.529	Advanced Property Insurance*	2	
44.530	Advanced Property—Casualty Insurance*	2	
44.543	Law of Insurance*	2	14
			—
Electives			
	Liberal Arts	4	
	Business Administration or		
	Liberal Arts	26	30
			—
	Total Credits		174

Additional Department Offerings

45.664, 45.665 EDP in Property and Casualty I, II 4

The following course is frequently offered as a single quarter intensive during the regular school year. Please refer to the current Schedule of Courses and Registration Guide for details.

21.601, 21.602 Principles of Sociology I, II 8**

Please see page 235 for course descriptions.

Upper level Business Administration course—see p. 54.

Additional 2 quarter hours of credit may be applied to Liberal Arts electives.

MANAGEMENT**Bachelor of Science Degree**

			quarter hours
Associate Degree Program			96
Core Courses—Liberal Arts			
21.501, 21.502, 21.503	Sociology I, II, III	6	
26.501, 26.502, 26.503	Introduction to Philosophy I, II, III	6	
30.511, 30.512, 30.513	Business Writing and Reports I, II, III	6	
39.531, 39.532, 39.533	Business Cycles I, II, III	6	24
Core Courses—Business Administration			
44.507, 44.508, 44.509	Corporate Finance I, II, III	6	
45.541, 45.542, 45.543	Law I, II, III*	6	12
Major Concentration Courses			
19.532, 19.533, 19.534	Industrial Psychology I, II, III*	6	
41.533, 41.534, 41.535	Accounting for Management Decisions I, II, III	6	
43.532, 43.533, 43.534	Marketing Management I, II, III*	6	
45.523, 45.524, 45.525	Management Seminar I, II, III*	6	
45.533, 45.534, 45.535	Management Decisions and Policies I, II, III*	6	30
Electives			
	Business Administration or Liberal Arts		12
	Total Credits		174
Additional Department Offerings			
45.577	Data Systems Administration	2	
45.586, 45.587, 45.588	Systems Design and Techniques I, II, III	6	
45.603, 45.604	Administrative Management and Office Services I, II	4	
45.616, 45.653	Government Data Processing Applications I, II	4	
45.618, 45.619	Retail Data Processing Applications I, II	4	
45.655, 45.656	Auditing Data Processing Applications I, II	4	
45.661, 45.662	Banking Data Processing Applications I, II	4	
45.664, 45.665	EDP in Property and Casualty I, II	4	
45.667	Project Planning and Control	2	
45.670, 45.671, 45.672	Management of Change I, II, III	6	
45.696	Principles and Practice of Management	2	
49.504, 49.505	Strategy for Planning I, II	6	

Please see page 236 for course descriptions.

The following courses are frequently offered as single quarter intensives during the regular school year. Please refer to the current Schedule of Courses and Registration Guide for details.

21.601, 21.602	Principles of Sociology I, II	8**
44.505	Corporate Finance	6

*Upper level Business Administration course—see p. 54.

**Additional 2 quarter hours of credit may be applied towards Liberal Arts electives.

MANAGEMENT INFORMATION SYSTEMS Bachelor of Science Degree

quarter hours
96

Associate Degree Program**Core Courses—Liberal Arts**

21.501, 21.502, 21.503	Sociology I, II, III	6
26.501, 26.502, 26.503	Introduction to Philosophy I, II, III	6
30.511, 30.512, 30.513	Business Writing and Reports I, II, III	6 18

Core Courses—Business Administration

43.501, 43.502, 43.503	Introduction to Marketing I, II, III	6
44.507, 44.508, 44.509	Corporate Finance I, II, III	6
45.510, 45.611	Labor Management Relations I, II	4
45.511, 45.512	Human Relations in Organizations I, II	4
45.541, 45.542, 45.543	Law I, II, III*	6 26

Major Concentration Courses

45.589, 45.590, 45.591	Advanced Systems Design I, II, III*	6
45.592, 45.593, 45.594	Advanced Systems Techniques I, II, III*	6
45.630	Introduction to Operations Research	2
45.631, 45.632	Operations Research Applications I, II*	4
45.668, 45.669	Peripheral Systems Techniques I, II	4 22

Electives

Liberal Arts	2
Business Administration or Liberal Arts	10
Total Credits	174

Additional Department Offerings

45.574, 45.575	Computer Programming for Business I, II	4
5.685, 45.686, 45.687	Computer Programming for Scientific Applications I, II, III	6
45.516, 45.653	Government Data Processing Applications I, II	4
5.617, 45.618, 45.619	Advanced Comp. Programming I, II, III	6
45.655, 45.656	Audit. Data Processing Applications I, II	4
45.658, 45.659	Retail. Data Processing Applications I, II	4
45.661, 45.662	Banking Data Processing Applications I, II	4
45.664, 45.665	EDP in Property and Casualty Insurance I, II	4
5.677, 45.678, 45.679	Operating Systems I, II, III	6
5.680, 45.681, 45.682	Computer Communications Systems I, II, III	6
45.697, 45.698	Information Processing in Medicine	4
49.504, 49.505	Strategy for Planning	6

Please see page 248 for course descriptions.

The following courses are frequently offered as single quarter intensives during the regular school year. Please refer to the current Schedule of Courses and Registration Guide for details.

21.601,	21.602	Principles of Sociology I, II	8**
	43.504	Introduction to Marketing	6
	44.505	Corporate Finance	6
	45.641	Human Relations in Organization	4
	45.690	Labor Management Relations	4

**Additional 2 quarter hours of credit may be applied towards Liberal Arts electives.

MARKETING**Bachelor of Science Degree**

			quarter hours
Associate Degree Program			96
Core Courses—Liberal Arts			
21.501, 21.502, 21.503	Sociology I, II, III	6	
26.501, 26.502, 26.503	Introduction to Philosophy I, II, III	6	12
			—
Core Courses—Business Administration			
43.518, 43.519, 43.522	Retailing & Mass Merchandising I, II, III	6	
45.541, 45.542, 45.543	Law I, II, III*	6	12
			—
Major Concentration Courses			
43.507, 43.508, 43.509	Sales Management I, II, III	6	
43.511, 43.512, 43.513	Creative Marketing Communications I, II, III	6	
	43.520 Industrial Marketing	2	
43.525, 43.526	Market Research I, II*	4	
	43.529 International Marketing	2	
43.532, 43.533, 43.534	Marketing Management I, II, III*	6	
	43.537 Marketing and Sales Seminar*	2	28
			—
Electives			
	Liberal Arts	10	
	Business Administration or Liberal Arts	16	26
			—
	Total Credits		174

Additional Department Offerings

43.530	Consumer Behavior Seminar	2
43.536	Introduction to Advertising	2
43.541, 43.542	Public Relations I, II	4
43.543, 43.544	Salesmanship I, II	4
	45.577 Data Systems Administration	2
45.618, 45.619	Retail Data Processing Applications I, II	4
45.685, 45.686, 45.687	Computer Programming for Scientific Applications I, II, III	6
49.504, 49.505	Strategy for Planning I, II	6

Please see page 229 for course descriptions.

The following course is frequently offered as a single quarter intensive during the regular school year. Please refer to the current Schedule of Courses and Registration Guide for details.

21.601, 21.602	Principles of Sociology I, II	8**
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*Upper level Business Administration course—see p. 54.

**Additional 2 quarter hours of credit may be applied towards Liberal Arts electives.

PERSONNEL AND INDUSTRIAL RELATIONS Bachelor of Science Degree

		quarter hours
Associate Degree Program		96
Core Courses—Liberal Arts		
21.501, 21.502, 21.503	Sociology I, II, III	6
26.501, 26.502, 26.503	Introduction to Philosophy I, II, III	6
		<u>12</u>
Core Courses—Business Administration		
45.541, 45.542, 45.543	Law I, II, III*	6
		<u>6</u>
Major Concentration Courses		
45.513, 45.514, 45.515	Personnel Management I, II, III	6
45.517	Techniques of Employee Selection	2
45.518	Wage and Salary Administration*	2
45.521	Employee Benefits and Social Security	2
45.522	Job Evaluation	2
45.545	Law of Employment Standards*	2
45.546	Law of Employment Conditions*	2
45.548	Law of Labor Management Relations*	2
45.553	The Labor Agreement*	2
45.556	Negotiation, Mediation, Arbitration*	2
45.560	Seminar on Labor Issues*	2
		<u>26</u>
Electives		
	Liberal Arts	10
	Business Administration or Liberal Arts	
	24	34
	Total Credits	174

Additional Department Offerings

45.552	Advanced Human Relations	2
45.557	International Labor Movements	2
45.670, 45.671, 45.672	Management of Change I, II, III	6
46.691	Creative Problem-Solving	2
49.504, 49.505	Strategy for Planning I, II	6

Please see page 243 for course descriptions.

The following courses are frequently offered as single quarter intensives during the regular school year. Please refer to the current Schedule of Courses and Registration Guide for details.

21.601, 21.602	Principles of Sociology I, II	8**
45.607	Personnel Management	6

*Upper level Business Administration course—see p. 54.

**Additional 2 quarter hours of credit may be applied towards Liberal Arts electives.

**TRANSPORTATION AND PHYSICAL
DISTRIBUTION MANAGEMENT**
Bachelor of Science Degree

			quarter hours
Associate Degree Program			96
Core Courses—Liberal Arts			
21.501, 21.502, 21.503	Sociology I, II, III	6	6
		<hr/>	
Core Courses—Business Administration			
43.532, 43.533, 43.534	Marketing Management I, II, III	6	
45.533, 45.534, 45.535	Management Decisions & Policies I, II, III	6	
45.541, 45.542, 45.543	Law I, II, III	6	
48.514, 48.515, 48.516	Elements of Transportation and Distribution I, II, III	6	24
		<hr/>	
Major Concentration Courses—Students specializing in the Management of Transportation companies:			
	45.553 The Labor Agreement	2	
	45.556 Negotiations, Mediation, Arbitration	2	
45.670, 45.671, 45.672	Management of Change I, II, III	6	
48.534, 48.535, 48.536	Surface Transportation I, II, III	6	
	48.537 Surface Transportation IV	2	
48.541, 48.542, 48.543	Air Transportation Management I, II, III	6	
48.547,	48.548 Urban Transportation I, II	4	
	48.549 Seminar in Selected Topics	2	
	48.600 Seminar in Northeast Corridor Transportation	2	32
		<hr/>	
Electives	Liberal Arts	10	
	Business Administration	6	16
		<hr/>	
	Total Credits		174

**Major Concentration Courses—Students specializing
in Physical Distribution Management:**

45.537, 45.538, 45.539	Facilities Planning and Design I Purchasing I, II, III	2 6
45.636, 45.637	Production and Inventory Control I, II	4
45.638, 45.639, 45.640	Industrial Decision Making I, II, III	6
48.504, 48.505, 48.506	Transportation Regulation and Promotion I, II, III	6
48.527, 48.528, 48.529	Traffic Management I, II, III	6
	48.537 Surface Transportation IV	2
	48.538 Management of Warehouse Operations	2
	48.539 Organization and Control of Physical Distribution Management	2

48.540	Management Science & Physical Distribution Management	2	
48.549	Seminar in Selected Topics	2	40
<hr/>			<hr/>
Electives	Liberal Arts	8	8
	Total Credits		174
			<hr/>

The following course is frequently offered as a single quarter intensive during the regular school year. Please refer to the current Schedule of Courses and Registration Guide for details.

21.601,	21.602	Principles of Sociology I, II	8**
	45.680	Production and Inventory Control	4

Please see page 256 for course descriptions.

**Additional 2 quarter hours of credit may be applied towards Liberal Arts electives.

**COMBINED PROGRAM IN LIBERAL ARTS
AND MANAGEMENT**
Bachelor of Science Degree
LIBERAL ARTS COURSES

Basic Courses				quarter hours
10.327,	10.328,	10.329	Mathematics I, II, III	6
19.501,	19.502,	19.503	Psychology I, II, III	6
23.501,	23.502,	23.503	Western Civilization I, II, III	6
	30.601,	30.602	Composition and Rhetoric I, II	4
	30.604,	30.605	Introduction to Literary Forms I, II	4
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6
				32
Core Courses				
16.501,	16.502,	16.503	Earth Science I, II, III	6
21.501,	21.502,	21.503	Sociology I, II, III	6
22.501,	22.502,	22.503	Principles of Political Science I, II, III	6
23.504,	23.505,	23.506	American History I, II, III	6
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6
39.511,	39.512,	39.513	Statistics I, II, III	6
Fine Arts:			Art, Music or Theatre Arts	6
Literature:			English, American, or other in Translation	6
				48
Electives			Literature	4
			Liberal Arts	18
				22

MANAGEMENT COURSES

Core Courses				
41.501,	41.502,	41.503	Accounting Principles I, II, III	6
43.501,	43.502,	43.503	Introduction to Marketing I, II, III	6
		44.501	Principles of Finance	2
		44.502	Principles of Investments	2
		44.503	Principles of Insurance and Risk Management	2
44.507,	44.508,	44.509	Corporate Finance I, II, III	6
45.501,	45.502,	45.503	Management and Organization I, II, III	6
	45.511,	45.512	Human Relations in Organizations I, II	4
45.541,	45.542,	45.543	LAW I, II, III*	6
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6
	45.610,	45.611	Labor Management Relations I, II	4
				50
Electives—Business Administration				22
			Total Credits	174

*Upper level Business Administration course—see p. 54.

**These Liberal Arts courses and all of the MANAGEMENT COURSES listed above with the exception of LAW I, II, III are frequently offered as single quarter intensives during the regular school year. Please refer to the current Schedule of Courses and Registration Guide for details. Any Liberal Arts courses taken as intensive for 8 quarter hours of credit will permit applying the additional 2 quarter hours to the Liberal Arts electives.

liberal arts

Harold Naidus, Associate Dean
Director, Liberal Arts Programs
Telephone 437-2416

Aims

In providing the means to a modern liberal education, University College has the main objective of stimulating and guiding the self-development of the student in three main areas: first, his intellectual growth; second, the development of his character and sense of values; and third, his preparation for, or advancement in, a career.

Intellectual growth—the development of the ability to think independently and creatively—rests upon the foundation of a sound general education. Through the liberal arts curricula, students are guided toward an appreciative understanding of the active discovery of ideas and methods in the areas of humanities, natural science, and social science. With this training, the student can more fully realize the basic values upon which civilization rests and can more fully participate in the intellectual, moral, and material achievement of that civilization.

Through its many programs, University College endeavors to provide experiences conducive to the development of strength of character and a sense of personal responsibility, including such personal qualities as self-reliance, integrity, perseverance, and the ability to work with others.

University College holds that there is no inconsistency between a truly liberal education and preparation for a vocation. As an adventure in intellectual discovery, a liberal education leads to the broadening and intensification of interests as the student becomes aware of his own mental strengths and weaknesses. This discovery is essential for making more intelligent and realistic appraisals of himself and his career. His career brings meaning and focus to his educational experience. His education presents both a challenge to accept responsibility and an opportunity to seek knowledge and skills for himself.

Methods

To enable each student to plan a college program in keeping with his own interests and aptitudes, a wide range of electives is offered. This does not mean that students are free to elect courses indiscriminately, for if they are to obtain a liberal education they must have training in several basic fields.

Therefore, the Curriculum Committee of University College has established basic minimum requirements in each of several fields. These distribution requirements are outlined with each of the program offerings.

Bachelors Degrees

Bachelor of Arts

Matriculated students must petition for the B.A. degree or the former B.S. will be awarded. Matriculating students must indicate their choice of degree programs, if the major department offers the option.

Major fields of study are offered in Economics, English, Art, Political Science, History, Psychology, Sociology-Anthropology, and Music. Students should choose their major field of study and their electives in consultation with a program adviser.

The distribution requirements, including specific required courses are shown with each curriculum.

Each curriculum normally provides for not less than 174 quarter hours of work, including at least 40 quarter hours of advanced work in a major field, and at least 30 quarter hours of elective liberal arts courses.

All candidates for the Bachelor of Arts degree must have satisfactorily completed in college one full year of a modern language beyond the elementary level, 4 q.h. of Composition and Rhetoric and 4 q.h. of Introduction to Literary Forms.

No student transferring from another college or university is eligible to receive a degree, until at least 46 quarter hours of academic work have been completed at Northeastern University immediately preceding graduation.

New Bachelor of Science

Some departments have elected to offer a new B.S. degree, the requirements for which are listed after the B.A. degree in the following pages (unless otherwise stated, the requirements are the same as for the B.A. degree).

Chemical-Biological Technology Programs

Recognizing the need for technicians and technologists in modern society, University College offers the following programs (formerly in Lincoln College):

Chemical-Biological Technology (A.S.)	page 99
Chemical-Biological Technology (B.S.)	page 100

The Associate in Science Degree

The program leading to the Associate degree is offered for those desiring a general cultural background in the liberal arts and humanities, but who do not wish to pursue a major field of concentration for the baccalaureate degree.

Candidates for the Associate in Science degree in Liberal Arts must complete a minimum of 96 quarter hours of credit. This is approximately one half of the requirements (174 quarter hours) for the Bachelor of Science degree.

To provide a balanced program which will achieve the established objectives, the faculty has set a minimum credit requirement in the several areas of study as listed under each major.

Distribution Requirements

For the purpose of satisfying the distribution requirements in all Liberal Arts Majors:

Math-Science includes only courses in Mathematics (10), Physics (11), Chemistry (12), Earth Science (16), Biology (18), and Psychology (lab. courses only) (19).

Humanities includes only courses in Art (27), Speech and Theatre Arts (29), English (except required) (30), Journalism (38), Modern Languages (31 to 34) (except required elementary or conversational), Philosophy (26), and Music (28).

Social Sciences includes only courses in Economics (39), History (23), Political Science (22), Psychology (except laboratory courses) (19), Social Welfare (25), and Sociology-Anthropology (20 and 21).

English Requirement

The 8 q.h. of *required English** must be taken prior to matriculation. These are required courses which cannot be used to satisfy distribution requirements in any liberal arts course of study.

30.601, 30.602, (or 30.603) Composition and Rhetoric I, II, or (Intensive)	4 q.h.
30.604, 30.605, (or 30.606) Introduction to Literary Forms I, II (or Intensive)	4 q.h.

Honors Program

An upperclass honors program is provided in University College to enable superior students to develop their potential to the highest degree by making it possible for them to pursue studies in their major fields to greater depth than is possible in the regular courses.

The nature of the program is determined by the academic department concerned. Programs may involve any of the following elements: special research projects culminating in honor theses, seminars, reading projects, directed independent study, or creative work. Flexibility is the keynote, with every consideration given to the individual needs and requirements of the student.

Students who have earned 96 quarter hours of credit toward their Bachelor's degree and who have a grade-point average of 3.0 or better are eligible to apply to the Director of Liberal Arts in University College for admission to the program. Acceptance as an honors candidate rests with the academic department concerned.

*For new English requirements see explanation on page 209.

Acceptance of Credits by the College of Liberal Arts*

The College of Liberal Arts permits its students to enroll for credit in all courses in University College offered on a quarterly basis, when they are pertinent to the student's program and have been approved by the Dean of the College of Liberal Arts. The credits for such courses may be applied:

1. To the total number of credits needed for graduation
2. To satisfy distribution requirements
3. To fulfill language and major deficiencies

Credits from University College, as well as those from other accredited institutions, may not be applied to the quality point average of students in the College of Liberal Arts except when such credits are from courses taken as substitutes for those College of Liberal Arts courses failed by students. In such instances students must receive a grade of C or better in the University College courses and then only 2.0 quality points are applied to the student's record for each course. Courses taken in University College which are not offered in the Liberal Arts College, may be transferred with the full grade upon approval of the major department.

Transfer of Students to the College of Liberal Arts*

Those students enrolled in University College who wish to transfer to the College of Liberal Arts must apply through the Department of Admissions of the Basic Colleges.

Advanced Standing Credit—Credit for Non-Collegiate Experience (NCE)

A matriculated Liberal Arts student with a departmental major in University College may obtain up to 16 quarter hours of credit (excluding CLEP credit) for knowledge acquired in a non-traditional manner.

The student will petition his major adviser (with a copy to the Director of Admissions) for such credit, listing the Liberal Arts course(s), as well as the reasons, for which he feels he should receive credit. He may also petition for credit for subject matter which has no counterpart course in University College. The major adviser will contact the consultant of the appropriate Liberal Arts department to arrange for an appraisal of the student's credentials. At the discretion of the department, this appraisal may or may not include a formal examination. Upon receipt of the consultant's recommendation, the student may request the Director of Admissions to inform him of the status of his petition.

In order to plan their last year and to expedite the evaluation of their petition for NCE credit, students planning to graduate during a particular year are urged to submit petitions prior to June 1 of the year preceding graduation. No petitions can be considered after February 1 for June graduation or after March 1 for September graduation.

In no case will this credit be considered as partial fulfillment of the residence requirement nor will a grade be assigned.

*One of the Basic (day) Colleges of Northeastern University.

No credit will be assigned in this manner for courses which can be accredited through the CLEP testing program at the time of the petition.

Wherever possible, credit will be assigned for specific courses.

It is possible that this credit may be applicable toward a degree in University College only.

Field Work Courses

To provide the opportunity for a student to apply his academic background to practical problems, several departments have introduced courses in their curriculum entitled "Field Work in . . .".

A field work course shall have the following characteristics (as voted by the Curriculum Committee):

1. It shall be a one quarter course worth six quarter hours of credit.
2. Only matriculated majors within the department offering the course may register.
3. The prerequisites shall be departmentally established.
4. Each student shall make his own arrangement for carrying on suitable field work at a departmentally acceptable organization involving departmentally acceptable field work experience(s). The department will participate in student placement only in an advisory capacity.
5. Each student shall spend a minimum of fifteen hours per week at the outside organization on a volunteer or paid basis.
6. Each student shall meet with the departmental field work adviser as frequently as the adviser feels necessary but, in any case, no fewer than three times per quarter (once to formulate the program of field work experience, once to discuss on-going work and once to transmit and discuss the final written report.)
7. The student's grade shall be dependent upon both the quality of the experience as demonstrated in the final report and the discussions between the U.C. field work adviser and the outside supervisor.
8. So long as one student registers, the course will not be cancelled.
9. The outside supervisor will be offered a transferable voucher for a tuition-free course at Northeastern University.

Prior to registration, each student should consult with his major department.

All field work courses will be numbered as follows: —.699

ECONOMICS

Bachelor of Arts Degree

(Students who matriculated prior to September 1973 must petition the UC Admissions Office for this degree.)

Distribution Requirements—(see page 80 for courses included in the three categories listed below:)

	quarter hours
Math-Science	16
Humanities	24
Social Sciences	24 64

Liberal Arts Program Requirements

*30.601, 30.602 (or 30.603)	Composition & Rhetoric I, II (or Intensive)	4
*30.604, 30.605 (or 30.606)	Introduction to Literary Forms I, II (or Intensive)	4
Modern Language:	Elementary or Conversational	12
	Intermediate	12
		32

Major Concentration Courses—required

39.507,	39.508,	39.509	Intermediate Economic Theory I, II, III	6
39.511,	39.512,	39.513	Statistics I, II, III	6
	39.517,	39.518	Money and Banking I, II	4
		39.519	Public Finance	2
		39.521	Economic Growth and Development I	2
		39.523	Government and Business I	2
		39.527	Labor Economics	2
39.528,	39.529	39.530	International Economics I, II	4
		39.530	Comparative Economic Systems	2
39.531,	39.532	39.581	Business Cycles I, II	4
			Economic Policy Seminar	2

The remaining twelve hours must be taken from the following courses:

	39.522	Economic Growth and Development II	2
39.524,	39.526	Government and Business II, III	4
	39.525	American Economic History	2
	39.533	Business Cycles III	2
39.536, 39.537,	39.538	Advanced Statistics I, II, III	6
	39.539	Managerial Economics	2
	39.540	History of Economic Thought	2
	39.551	Industrial Organization	2
	39.561	Urban Economics	2
	39.571	European Economic History	2

Elective Courses**

30

Total Credits

174

Bachelor of Science Degree

(None offered at this time.)

*These must be completed prior to matriculation.

*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses in a variety of fields beyond the major.

ENGLISH**Bachelor of Arts Degree**

(Students who matriculated prior to September 1973 must petition the UC Admissions Office for this degree.)

Distribution Requirements—(see page 80 for courses included in the three categories listed below:)

	quarter hours
Math-Science	16
Humanities	24
Social Sciences	<u>24</u> 64

Liberal Arts Program Requirements

*30.601, 30.602 (or 30.603)	Composition & Rhetoric I, II (or Intensive)	4
*30.604, 30.605 (or 30.606)	Introduction to Literary Forms I, II (or Intensive)	4
Modern Language:	Elementary or Conversational Intermediate	<u>12</u> 12 32

Major Concentration Courses—required**Preliminary Courses—all courses required**

30.541, 30.542, 30.543	English Literature I, II, III	6
30.544, 30.545, 30.546	American Literature I, II, III	6
	30.517 Intermediate Writing	<u>2</u> 14

Major Figures in English Literature—three courses required

30.551, 30.552, 30.553	Chaucer I, II, III	6
	30.561 Spenser	2
30.554, 30.555, 30.556	Shakespeare I, II, III	6
	30.562 Milton	<u>2</u> 6

Major Periods in English Literature—six courses required

30.557	The 17th Century	2
30.558, 30.559	The 18th Century I, II	4
30.571, 30.572, 30.573	The 19th Century I, II, III	6
30.574, 30.575, 30.576	The 18th-Century English Novel The 19th-Century English Novel The 20th-Century English Novel	<u>6</u> 12

American Literature—three courses required

30.581, 30.582, 30.583	The American Short Story; The 19th-Century American Novel The 20th-Century American Novel	6
	30.578 Afro-American Literature	2
	30.584 Contemporary American Poetry	<u>2</u>

Literature in Translation—three courses required

30.531, 30.532, 30.533	Western World Literature I, II, III	6
30.534, 30.535, 30.536	Western World Literature IV, V, VI	<u>6</u>

English Electives

Open Electives		20
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Total Credits

These may include 30.591, 30.592, 30.593 Honors Programs I, II, III

*These must be completed prior to matriculation.

ENGLISH (cont.)**Bachelor of Science Degree**

Unless otherwise stated, requirements are the same as for the B.A. degree.

Modern Language:	none
English Electives:	16 q.h.
Open Electives:	42 q.h.

FINE ARTS**Bachelor of Arts Degree**

Students who matriculated prior to September 1973 must petition the UC Admissions Office for this degree.)

Distribution Requirements—(see page 80 for courses included in the three categories listed below:)

	quarter hours
Math-Science	16
Humanities	24
Social Sciences	<u>24</u> 64

Fine Arts Program Requirements

30.601, 30.602 (or 30.603)	Composition & Rhetoric I, II (or Intensive)	4
30.604, 30.605 (or 30.606)	Introduction to Literary Forms I, II (or Intensive)	4
Modern Language:	Elementary or Conversational	12
	Intermediate	<u>12</u> 32

Major Concentration Courses—required

15.504, 27.505, 27.506	History of Art I, II, III	6
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In addition to History of Art I, II, III required of all Fine Arts majors, each student will select a minimum of 38 quarter hours in Area I or 39 quarter hours in Area II.

Bachelor of Science Degree

Unless otherwise stated, requirements are the same as for the B.A. degree.

Modern Language:	none
Elective Courses:	58 q.h.

(Continued on following page.)

Area I—Art History Major

27.507	Ancient Architecture	2
27.508	Medieval and Renaissance Architecture	2
27.509	European Architecture	2
27.510,	57.511 Ancient Painting and Sculpture I, II	4
	27.512 Medieval Painting and Sculpture	2
27.515,	27.514 European Painting	2
	27.516 Modern Painting I, II,	4
27.524, 27.525,	27.518 20th-Century American Architecture	2
	27.519 20th-Century European Architecture	2
27.587, 27.588,	27.520 Italian Renaissance Art II	2
	27.522 French Painting	2
27.597, 27.598,	27.523 English Art	2
	27.526 American Art I, II, III	6
27.600, 27.601,	27.535 African Art	2
	27.536 Latin American Art	2
27.597, 27.598,	27.538 Chinese Art	2
	27.539 Japanese Art	2
27.587, 27.588,	27.547 European Graphic Arts	2
	27.560 Oriental Indian Art	2
27.597, 27.598,	27.589 History of Photography I, II, III	6
	27.592 New York Art Seminar	2
27.597, 27.598,	27.594 European Art Seminar	2
	27.599 History and Technique of Film I, II, III	6
27.600, 27.601,	27.602 Honors Program I, II, III	12
	27.603 Mexican Art	2

Area II—Studio Art Major**Required:**

27.541, 27.542,	27.543 Drawing I, II, III	9
27.561, 27.562,	27.563 Basic Color and Design I, II, III	9

Twenty one quarter hours must be taken from the following courses:

27.527, 27.528,	27.529 Life Drawing I, II, III	9
27.544, 27.545,	27.546 Graphic Arts I, II, III	9
27.551, 27.552,	27.553 Painting—Basic Level I, II, III	9
27.554, 27.555,	27.556 Painting—Advanced Level I, II, III	9
27.557, 27.558,	27.559 Advanced Graphic Arts I, II, III	9
	27.564 Advanced Color and Design	3
27.571, 27.572,	27.573 Basic Commercial Design I, II, III	9
	27.574 Advanced Commercial Design	3
27.600, 27.601,	27.602 Honors Program I, II, III	12

44-45

Elective Courses**Total Credits**

34

174

*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses in a variety of fields beyond the major.

HISTORY**Bachelor of Arts Degree**

(Students who matriculated prior to September 1973 must petition the UC Admissions Office for this degree.)

Distribution Requirements—(see page 80 for courses included in the three categories listed below:)

	quarter hours
Math-Science	16
Humanities	24
Social Sciences	24
	64
	<hr/>

Liberal Arts Program Requirements

*30.601, 30.602 (or 30.603) Composition & Rhetoric I, II
(or Intensive)

4

*30.604, 30.605 (or 30.606) Introduction to Literary Forms
I, II (or Intensive)

4

Modern Language: Elementary or Conversational
Intermediate

12

12

32

Major Concentration Courses—required

History majors are required to take 6 quarter hours of Western Civilization (23.501, 23.502, 23.503) and 6 quarter hours of the American History survey (23.504, 23.505, 23.506). These 12 credits are applicable to the social science distribution requirements for History majors.

12

Required in addition are 40 quarter hours of history courses to be distributed as follows:

	quarter hours
23.500 Historian's Craft	4
At least 6 quarter hours in each of the following four areas:	
I. Ancient Medieval, and Early Modern Europe	
II. Modern and Contemporary Europe	
III. American History	
IV. Other Regions	24

(See specific History courses at back of catalog for area designations.)

The remaining 12 quarter hours of history may be chosen from any of the above four areas. Students in the Honors Program (23.597, 23.598, 23.599) may use these 12 quarter hours.

12

40

Since September, 1972 some history courses carry 4 quarter hours of credit and may meet twice weekly.

Elective Courses****26****Total Credits****174**

(Continued on following page.)

*These must be completed prior to matriculation.

**While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses in a variety of fields beyond the major.

HISTORY (cont.)**Bachelor of Science Degree**

(Unless otherwise stated, requirements are the same as for the B.A. degree)

Distribution Requirements—

		quarter hours
	Math-Science	None
	Humanities	24
	Social Sciences	None
	Modern Language	None
	Other required courses	30
39.501, 39.502, 39.503	Economic Princ. & Problems I, II, III	6
39.511, 39.512, 39.513	Statistics I, II, III	6
21.501, 21.502, 21.503	Sociology I, II, III	6
21.512, 21.513, 21.514	Social Research Methods I, II, III	6
45.570, 45.571, 45.572	Electronic Data Processing I, II, III	6
Elective Course—		60

LIBERAL ARTS**Associate in Science Degree**

		quarter hours
Math—Science*		16
Humanities*		24
Social Sciences*		24
30.601, 30.602	Composition and Rhetoric I, II	4
30.604, 30.605	Introduction to Literary Forms I, II	4
Electives		24
		—
	Total Credits	96

*See page 80 for courses included in the various designations.

POLITICAL SCIENCE**Bachelor of Arts Degree**

(Students who matriculated prior to September 1973 must petition the UC Admissions Office for this degree.)

Distribution Requirements—(see page 80 for courses included in the three categories listed below:)

	quarter hours
Math-Science	16
Humanities	24
Social Sciences	24
	64
	—

Liberal Arts Program Requirements

30.601, 30.602 (or 30.603)	Composition & Rhetoric I, II (or Intensive)	4
30.604, 30.605 (or 30.606)	Introduction to Literary Forms I, II (or Intensive)	4
Modern Language:	Elementary or Conversational	12
	Intermediate	12
		32
		—

Major Concentration Courses—required

Prerequisites: Principles of Political Science I, II, III (22.501, 22.502, 22.503) which may be taken out of sequence if necessary, or Principles of Political Science (Intensive) (22.507).

(Continued on following page)

Bachelor of Science Degree

A Bachelor of Science program in which quantitative requirements are substituted for modern language will be available to Political Science Majors effective September 1974. For details on the curriculum, students are referred to the adviser to Political Science majors in the Department.)

Each student will select a minimum of 6 q.h. from the following four areas, as indicated:

Area I—American Government

quarter hours

22.511	American National Government	2
	any additional two courses from among:	4
22.512	Urban and Metropolitan Government	2
22.514	American Constitutional Law	2
22.515	Civil Rights	2
22.516	Public Administration I	2
22.517	Public Administration II	2
22.518	Government and Politics of States	2
22.551	Current Political Issues	2

Area II—Comparative Government

22.521	Comparative Government I	2
22.522	Comparative Government II	2
	any additional one course from among:	2
22.537	European Political Parties	2
22.544	Government and Politics in the Soviet Union I	2
22.545	Government and Politics in the Soviet Union II	2
22.547	Government and Politics of Communist China I	2
22.548	Government and Politics of Communist China II	2
22.552	Government and Politics of the Middle East I	2
22.553	Government and Politics of the Middle East II	2
22.555	Government and Politics in Latin America I	2
22.556	Government and Politics in Latin America II	2
22.558	Government and Politics of South East Asia	2
22.559	Government and Politics of Japan	2
22.560	Politics and Policies of Developing Nations I	2
22.561	Politics and Policies of Developing Nations II	2
22.562	Government and Politics of Sub Saharan Africa	2
22.563	Government and Politics of Northern Africa	2

Area III—International Relations

22.535	International Relations (not to be taken by students who have credit for 22.531)	4
	any additional one course from among:	2
22.532	International Organization	2
22.534	Soviet Foreign Policy	2
22.538	Communist China's Foreign Policy	2
22.541	International Law	2
22.533	American Foreign Policy	2
22.542	American Foreign Policy I	2
22.543	American Foreign Policy II	2
22.564	Communism in Eastern Europe I	2
22.565	Communism in Eastern Europe II	2

Area IV—Theory and Methodology

22.536	Introduction to Political Theory (not to be taken by students who have credit for 22.504)	4
	any additional one course from among:	2
22.505	Contemporary Political Theory	2
22.506	American Political Thought	2
22.508	Research Methods	2

Political Science Electives. A total of 18 quarter hours of elective courses from any or all of the above areas, and may include the maximum number of quarter hours credit for Honors permitted by the College.

18

Other Electives. Social Sciences other than Political Science, including not fewer than 6 quarter hours of each of three different disciplines selected from Economics, History, Psychology, and Sociology-Anthropology.

18**Other****18****Total Credits****174**

PSYCHOLOGY**Bachelor of Arts Degree**

(Students who matriculated prior to September 1973 must petition the UC Admissions Office for this degree.)

Distribution Requirements—(see page 80 for courses included in the three categories listed below:)

	quarter hours
Math-Science	16
Humanities	24
**Social Sciences	24
	64
	—

Liberal Arts Program Requirements

*30.601, 30.602 (or 30.603)	Composition & Rhetoric I, II or (Intensive)	4
*30.604, 30.605 (or 30.606)	Introduction to Literary Forms I, II (or Intensive)	4
Modern Language:	Elementary or Conversational	12
	Intermediate	12
		32
		—

(Continued on following page)

Bachelor of Science Degree

(None offered at this time.)

**It is recommended that Psychology majors substitute 19.508 and 19.509—Fundamentals of Psychology I and II for 19.501, 502, and 503.
*These must be completed prior to matriculation.

Major Concentration Courses—required

19.504,	19.505,	19.506	Statistics in Psychology I, II, III	6
19.551,	19.552,	19.533	Experimental Psychology I, II, III	9
19.561,	19.562,	19.563	Historical Development of Psychology I, II, III	6

In addition to the courses listed above, required of all Psychology majors, each student will select a minimum of 22 hours from the following courses:

19.511,	19.512	Child Psychology I, II	4	
	19.513	Adolescent Psychology	2	
19.521,	19.522	Personality I, II	4	
	19.523	Motivation	2	
19.524,	19.525	Social Psychology I, II	4	
	19.526	Psychology of Aggression	2	
	19.527	Psychology of Conformity and Rebellion	2	
	19.528	Psychological Factors in National and International Conflict	2	
	19.529	Interpersonal Behavior in the Small Group I	2	
	19.530	Interpersonal Behavior in the Small Group II	2	
	19.535	Psychological Factors in the Creative Process	2	
	19.536	Psychology of Thought	2	
	19.537	Psychology of Language	2	
	19.538	Psychology of Learning	2	
19.541,	19.542,	19.543 Abnormal Psychology I, II, III	6	
		19.546 Psychological Testing I	2	
		19.547 Psychological Testing II	2	
		19.560 Psychology of Women	2	
		19.571 Seminar in Psychology	2	43
19.591,	19.592,	19.593 Honors Program I, II, III	8 only	

Elective Courses*	35
Total Credits	174

*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses in a variety of fields beyond the major.

SOCIOLOGY-ANTHROPOLOGY**Bachelor of Arts Degree**

(Students who matriculated prior to September 1973 must petition the UC Admissions Office for this degree.)

Distribution Requirements—(see page 80 for courses included in the three categories listed below:)

	quarter hours
Math-Science	16
Humanities	24
Social Sciences	24
	64
	<hr/>

Liberal Arts Program Requirements

*30.601, 30.602 (or 30.603)	Composition & Rhetoric I, II (or Intensive)	4
*30.604, 30.605 (or 30.606)	Introduction to Literary Forms I, II (or Intensive)	4
Modern Language:	Elementary or Conversational	12
	Intermediate	12
		32
		<hr/>

Bachelor of Science Degree

Unless otherwise stated, requirements are the same as for the B.A. degree.

Distribution requirements—

Math-Science	none
Humanities	none
Social Sciences	24 q.h. (other than soc-anthro.)

Modern Language	none
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For those anticipating work in applied social welfare, it is highly recommended that at least elementary or conversational courses in an appropriate language be mastered.)

Major Concentration Requirements

Same as for the B.A. degree plus at least 10 additional quarter hours of advanced courses, of which 4 q.h. should be in anthropology.

Electives:	78 q.h.
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(Students are encouraged to elect math-science and humanities for adequate educational breadth.)

For students planning to attend graduate school, the B.A. degree is recommended.

*These must be completed prior to matriculation.

Major Concentration Courses—required			quarter hours
20.501,	20.502,	20.503 Anthropology I, II, III	6
21.501,	21.502,	21.503 Sociology I, II, III	6
21.512,	21.513,	21.514 Social Research Methods I, II, III	6
21.517,	21.518,	21.519 Social Theory I, II, III	6

The student may choose to substitute for any of the course sequences above more intensive versions under the following numbers and titles:

20.601, 20.602	Principles of Anthropology I, II	8
21.601, 21.602	Principles of Sociology I, II	8
21.612, 21.613	Social Research Methods I, II (Intensive)	8
21.617, 21.618	Social Theory I, II (Intensive)	8

The major is required to take 30 quarter hours of advanced courses from among the following offerings:

20.521	Culture and Personality	2
20.531	Primitive Social Organization	2
20.532	Primitive Religion	2
20.533	Acculturation	2
20.537	Anthropological Theory	2
20.541	North American Indian	2
20.544	African Peoples and Culture	2
20.547	Latin American Peoples and Culture	2
20.548	Studying the Family Cross-Culturally	2
20.549	Folklore	2
20.550	Peasant Society and Culture as an Anthropological Problem	2
20.551	The Comparative Study of changing Peasantries	2
20.552	Eastern European Peasantry in the Modern World	2
21.505	Drugs and Society	2
21.506	Sociology of Religion	2
21.507	Sex in Society: The Study of Sex Roles	2
21.508	Sociology of Literature	2
21.509	Sociology of Socialist Societies	2
21.528	Social Stratification	2
21.531	Social Change	2
21.534	Social Control	2
21.535	Political Sociology	2
21.546	Sociology of Deviant Behavior	2
21.547	Social Problems	2
21.550	Juvenile Delinquency	2
21.551, 21.552	Family and Marriage I, II	4

21.553, 21.554,	21.555	Racial and Cultural Relations I, II, III	6
	21.556	Sociology of Poverty	2
	21.557	Urban Sociology	2
	21.558	Community Analysis	2
	21.559	Seminar in Urban Studies	2
	21.560	Medical Sociology	2
	21.561	Sociology of Mental Health	2
	21.563	Social Gerontology	2
	21.567	Population	2
	21.570	Sociology of Occupations and Professions	2
	21.573	Sociology of Industry	2
	21.575	Sociology of Formal Organizations	2
21.591, 21.592,	21.593	Honors Programs I, II, III	12
			—
Elective courses*			24
		Total Credits	174

*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses in a variety of fields beyond the major.

MUSIC**Bachelor of Arts Degree**

(Students who matriculated prior to September 1973 must petition the UC Admissions Office for this degree.)

Distribution Requirements—(see page 80 for courses included in the three categories listed below:)

	quarter hours
Math-Science	16
Humanities	24
Social Sciences	24
	64
	—

Liberal Arts Program Requirements

*30.601, 30.602 (or 30.603)	Composition & Rhetoric I, II (or Intensive)	4
*30.604, 30.605 (or 30.606)	Introduction to Literary Forms I, II (or Intensive)	4
Modern Language:	Elementary or Conversational	12
	Intermediate	12
		32
		—

Major Concentration Courses—required

28.599, 28.600, 28.601	Theory I, II, III	6
28.605, 28.606, 28.607	Theory IV, V, VI	6
28.608, 28.609,	Contrapuntal Techniques I, II	4
28.534, 28.535, 28.536	Pedagogy of Music I, II, III	6
28.602, 28.603, 28.604	Music History I, II, III	6
28.528, 28.529, 28.530	Ear Training I, II, III	6
		34
		—

Bachelor of Science Degree

Unless otherwise stated, requirements are the same as for the B.A. degree.

Distribution Requirements—

quarter hours

Math-Science	7
Humanities	24
Social Sciences	24
Modern Language (Elementary or Conversational)	12

Electives

29

(May include Honors Program, 28.695, 28.696, 28.697)

Continued on following page.)

Major Concentration Courses—elective

Five of the following courses should be taken:

28.503	Women in Music	2
28.510	Music and Art	2
28.515	Contemporary Music	2
28.517	Music as a Means of Social Expression	2
28.520	Musical Forms	2
28.521	The Symphony	2
28.522	The Concerto	2
28.523	Great Literature for Piano	2
28.524	The World of Opera	2
28.525	Contemporary Opera	2
28.526	Jazz: Evolution and Essence	2
28.531	Life and Works of J. S. Bach	2
28.532	Life and Works of Mozart	2
28.533	Life and Works of Beethoven	2
28.543	Great Choral Literature	2
28.544	Chamber Music	2
28.545	Wagner's Ring Cycle	2
28.546	Life and Works of Stravinsky	2
28.547	The Music of Bruckner and Mahler	2
28.548	Great Love Songs through the Ages	2
28.549	A History of Musical Instruments in Western Culture	2
28.550	Life and Works of Haydn	2
28.551	Life and Works of Brahms	2
28.552	Life and Works of Chopin	2
28.553	Melodrama and the Macabre	2
28.571	Piano Class I	2
28.572	Piano Class II Prereq. 28.571	2
28.573	Piano Class III Prereq. 28.572	2
28.595	Opera Seminar	2
28.587	Symphony Seminar	2

Free Electives

34

Total Credits

174

CHEMICAL-BIOLOGICAL TECHNOLOGY

Associate in Science Degree

The program in Chemical-Biological Technology provides the chemistry and biology foundation required by medical and industrial laboratory assistants and technicians in clinically, chemically, or biologically oriented organizations, and for persons having paramedical responsibilities. Employment opportunities are in hospitals, health clinics, research foundations, chemical and drug industries, public health organizations, water and sanitation departments; and in the emerging fields of the oceanographic technologies.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Basic Mathematics I and II courses (10.330 and 10.331). The Mathematics Placement Test must be taken prior to registration.

First Year					quarter hours
10.327,	10.328,	10.329	Mathematics I, II, III or College Algebra & Trigonometry I, II		6
10.307,	10.308				8
11.304,	11.305,	11.306	General Physics I, II, III		6
12.544,	12.545,	12.546	General Chemistry I, II, III		6
12.547,	12.548,	12.549	General Chemistry Lab. I, II, III		3
30.601,	30.602		Composition & Rhetoric I, II		4
			English Elective		2
Second Year					
10.316,	10.317,	10.318	Probability and Statistics I, II, III or		6
10.320,	10.321,	10.322	Calculus I, II, III		8
			Social Science Elective I, II, III		6
18.511,	18.512,	18.513	Biology I, II, III		12
Third Year					
12.531,	12.532,	12.533	Organic Chemistry I, II, III		
12.534,	12.535,	12.536	Organic Chemistry Lab. I, II, III or		12
12.521,	12.522,	12.523	Analytical Chemistry I, II, III		
12.524,	12.525,	12.526	Analytical Chemistry Lab. I, II, III		
18.524,	18.525,	18.526	Human Anatomy and Physiology I, II, III		9
			Humanities Elective I, II, III		6
Fourth Year					
18.521,	18.522,	18.523	Microbiology I, II, III		12
			Biology or Chemistry Elective I, II, III		6
			Total Credits		96-100

Note: Associate degree graduates may transfer applicable credits toward the requirements in Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degrees, as well as University College programs.

CHEMICAL-BIOLOGICAL TECHNOLOGY**Bachelor of Science Degree**

The Chemical-Biological Technology program is an interdisciplinary program integrating theoretical and laboratory course sequences from the fields of chemistry and biology which prepare the student to assume responsibilities in laboratory careers which emphasize laboratory application and teaching careers in general science. Employment opportunities are in a wide variety of industrial, pharmaceutical, clinical, and hospital laboratories dealing with analytical, production, and research functions and in secondary school education in the teaching of general science, chemistry, biology, and other related courses.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Basic Mathematics I and II courses (10.330 and 10.331). The Mathematics Placement Test must be taken prior to registration.

First Year				quarter hours
10.316,	10.317,	10.318	Probability and Statistics I, II, III or	{ 6
10.307,	10.308		College Algebra & Trigonometry I, II	8
11.304,	11.305,	11.306	General Physics, I, II, III	6
12.544,	12.545,	12.546	General Chemistry I, II, III	6
12.547,	12.548,	12.549	General Chemistry Lab. I, II, III	3
30.601,	30.602		Composition and Rhetoric I, II	4
			English Elective	2
Second Year				
10.316,	10.317,	10.318	Probability and Statistics I, II, III or	{ 6
10.320,	10.321,	10.322	Calculus I, II, III	8
18.511,	18.512,	18.513	Biology I, II, III	12
23.501,	23.502,	23.503	Western Civilization I, II, III	6
Third Year				
12.521,	12.522,	12.523	Analytical Chemistry I, II, III	6
12.524,	12.525,	12.526	Analytical Chemistry Lab. I, II, III	6
18.524,	18.525,	18.526	Human Anatomy and Physiology I, II, III	9
19.501,	19.502,	19.503	Psychology I, II, III	6
Fourth Year				
12.531,	12.532,	12.533	Organic Chemistry I, II, III	6
12.534,	12.535,	12.536	Organic Chemistry Lab. I, II, III	6
18.521,	18.522,	18.523	Microbiology I, II, III	12
Fifth Year				
18.551,	18.552,	18.553	Histology-Organology I, II, III	6
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6
12.551,	12.552,	12.553	Instrumental and Radiochemistry I, II, III	6
16.531,	16.532,	16.533	Oceanography I, II, III	6

Sixth Year

18.561,	18.562,	18.563	Ecology I, II, III	6
12.541,	12.542,	12.543	Physical Chemistry I, II, III or	6
12.515,	12.516,	12.517	Biochemistry I, II, III	6
21.501,	21.502,	21.503	Sociology I, II, III	6
			*Elective	6

Seventh Year

18.557,	18.558	Genetics I, II	4	
18.556		Genetics Laboratory	2	
30.604,	30.605	Introduction to Literary Forms I, II	4	
		English Elective	2	
		*Electives as needed to complete		
		Total Credits		—

Total Credits	174
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law enforcement

Timothy F. Moran, Associate Dean
Director, Law Enforcement Programs
Telephone 437-3324

Aims

Law Enforcement programs of study are offered to meet the needs of present and potential practitioners in the fields of corrections, law enforcement, and security who wish to acquire a liberal education as well as a professional competence, or to gain recognition for development and attainment while pursuing a career in that profession.

Methods

The distribution requirements, including certain required courses, are shown with each curriculum. Upon petition, students may be permitted under certain circumstances to substitute other courses which will more adequately serve their specific objectives.

To provide a balanced program which will achieve the established objectives, the faculty has set minimum requirements in the areas of study outlined on the following pages, with a recommended sequence of courses for each program.

Bachelor of Science Degree Program

Major fields of study are offered in Correctional Practices, Law Enforcement, and Security. Students should choose their major field of study and their electives in consultation with a program adviser.

Each curriculum provides for not less than 174 quarter hours of work, including at least 60 quarter hours of advanced work in a major field.

No student transferring from another college or university is eligible to receive a degree until at least 46 quarter hours of academic work have been completed at Northeastern University immediately preceding graduation.

Associate in Science Degree Program

The program leading to the associate degree is offered for those who wish to obtain a general background in correctional practices, law enforcement or security, but do not wish to pursue a major field of concentration for the baccalaureate degree.

Candidates for the Associate in Science degree must complete a minimum of 96 quarter hours of credit. This is approximately one half of the requirements for the Bachelor of Science degree, and includes at least 40 quarter hours of work in a major field.

Honors Program

*The Honors Program in the field of law enforcement is designed to provide qualified students with the opportunity to achieve a broader and deeper intellectual academic experience within their chosen fields: corrections, law enforcement or security.

In general, the Honors Program consists of the following areas: independent study, directed reading seminar, independent research projects, and special seminars.

The particular academic structure of a student's Honors Program will be arranged in consultation with the Program Director and the Honors Faculty Committee, to direct the student's program.

The Honors Program is open to all matriculated Law Enforcement Program students in University College, who have obtained an associate degree or equivalent, and a minimum cumulative grade point average of 3.0. Students who are eligible for this program may apply for admission and approval, to the Director of Law Enforcement Programs.

Advanced Standing Credit—Credit for Non-Collegiate Experience (NCE)

A matriculated University College student with a department major in Corrections, Law Enforcement, or Security, may obtain up to 16 quarter hours of credit (excluding CLEP), by petitioning to take a comprehensive examination in the specific subject area based upon the student's knowledge acquired in a non-traditional manner. Petitions for these examinations may be obtained in 102 Churchill Hall or 200 Churchill Hall.

In no case will this credit be considered as partial fulfillment of the residence requirement nor will a letter grade be assigned.

No credit will be assigned in this manner for courses which can be accredited through the CLEP Testing Program at the time of the petition. Credit will only be assigned to specific courses. It is possible that this credit may be applicable toward a degree in University College only.

Course Sequence

The course sequence as listed is merely a frame of reference, a suggested guide to assist students in arranging their program. Students who wish to add a fifth course each quarter to this sequence may do so without approval of the department.

Intensive Courses

Many courses are frequently offered as single quarter intensives during the regular school year. Please refer to the listing of courses on page 283.

Intensive courses offer the opportunity for a student to achieve his objective in a shorter period of time, i.e., a student could reasonably earn a B.S. degree in five years, and an associate degree in three years.

CORRECTIONAL PRACTICES**Bachelor of Science Degree****Basic Courses—required**

			quarter hours
**10.327,	10.328,	10.329	6
19.501,	19.502,	19.503	6
23.501,	23.502,	23.503	6
*30.601,	30.602	Composition and Rhetoric I, II	4
30.604,	30.605	Introduction to Literary Forms I, II	4
39.501,	39.502,	Economic Principles and Problems I, II, III	6 32

Core Courses—required

19.524,	19.525	Social Psychology I, II	4
19.541,	19.542,	Abnormal Psychology I, II, III	6
21.501,	21.502,	Sociology I, II, III	6
	21.503	Social Control	2
	21.534	Social Problems	2
	21.547	Racial and Cultural Relations I, II	4
	21.557	Urban Sociology	2
22.501,	22.502,	Principles of Political Science I, II, III	6
	22.503	American Constitutional Law	2
	22.514	Civil Rights	2
	22.515	Public Administration I, II	4
	22.516,	American History I, II, III	6
23.504,	23.505,	Human Relations in Personnel I, II	4
	45.511,		50

*For new English requirements see explanation on page 209.

**94.601, 602, 603, L. E. Mathematics I, II, III may be taken in place of 10.327, 328, 329.

Major Concentration Courses—Required

	94.505	Human Rights in Corrections	2
	94.506	Basic Statistics in Law Enforcement	2
	94.507	Correctional Counseling	2
94.517, 94.518,	94.519	Advanced Correctional Practices I, II, III	6
	94.523	The Law and Institutional Treatment	2
	94.524	Comparative Correctional Systems	2
	94.525, 94.526	Law Enforcement Identification and Records I, II	4
	94.532	Research Methods in Criminal Justice	2
	94.544	The American Correctional System	2
	94.546, 94.547	Social Deviance I, II	4
94.551,	94.549, 94.550	Treatment of Offenders I, II	4
	94.552, 94.553	Correctional Administration I, II, III	6
	94.563, 94.564	Criminology I, II	4
	94.565	Delinquency Prevention	2
	94.567, 94.568	Probation and Parole Practices I, II	4
	94.574, 94.575	Juvenile Corrections I, II	4
	94.593	Seminar in Correctional Practices	2
	94.627, 94.628	Administration of Justice I, II	4
	94.631, 94.632	Criminal Law I, II	4
	94.633, 94.634	Evidence and Court Procedure I, II	4
			66

Elective Courses***26****Total Credits****174**

*For suggested electives and additional department offerings, see page 122. While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses from any other curricula in the University College Catalog.

CORRECTIONAL PRACTICES

Recommended Course Sequence for the 7-year Program Leading to the Bachelor of Science Degree

All new students should discuss their program with a program adviser before attempting to undertake the following sequence of courses:

	Quarter 1	Quarter 2	Quarter 3
1st Year	30.601 *Comp. & Rhet. I 94.627 Admin. of Justice I 94.631 Criminal Law I 94.633 Evid. & Ct. Proc. I	30.602 Comp. & Rhet. II 94.628 Admin. of Justice II 94.632 Criminal Law II 94.634 Evid. & Ct. Proc. II	94.505 Human Rts. in Corr. 94.544 Amer. Corr. System 94.523 Law & Inst. Treat. Elective
2nd Year	19.501 Psychology I 94.546 Soc. Deviance I 94.567 Prob. & Par. Prac. I 94.574 Juvenile Corr. I	19.502 Psychology II 94.547 Soc. Deviance II 94.568 Prob. & Par. Prac. II 94.575 Juvenile Corr. II	19.503 Psychology III Elective 94.507 Corr. Counseling
3rd Year	21.501 Sociology I 94.549 Treat. Offenders I 19.541 Abnorm. Psych. I 22.514 Amer. Const. Law	21.502 Sociology II 94.550 Treat. Offenders II 19.542 Abnorm. Psych. II 22.515 Civil Rights	21.503 Sociology III 94.506 Basic Stats. in L. E. 19.543 Abnorm. Psych. III 94.532 Res. Meth. Crim. Just.
4th Year	94.563 Criminology I 21.553 Rac. & Cul. Rel. I 94.551 Corr. Admin. I 23.504 Amer. Hist. I	94.564 Criminology II 21.554 Rac. & Cul. Rel. II 94.552 Corr. Admin. II 23.505 Amer. Hist. II	94.565 Del. Prevention 21.557 Urban Sociology 94.553 Corr. Admin. III 23.506 Amer. Hist. III

*For new English requirements see explanation on page 209.

5th Year	30.604 Intro. to Lit. - Forms I	30.605 Intro. to Lit. Forms II	Elective
	94.525 Law Enf. Id. & Rec. I	94.526 Law Enf. Id. & Rec. II	Elective
	22.501 Prin. Polit. Sci. I	22.502 Prin. Polit. Sci II	22.503 Prin. Polit. Sci. III
	45.511 Hum. Rel. in Pers. I	45.512 Hum. Rel. in Pers. II	Elective
6th Year	94.517 Adv. Corr. Prac. I	94.518 Adv. Corr. Prac. II	94.519 Adv. Corr. Prac. III
	39.501 Ec. Prin. & Prob. I	39.502 Ec. Prin. & Prob. II	39.503 Ec. Prin. & Prob. III
	23.501 Western Civ. I	23.502 Western Civ. II	23.503 Western Civ. III
	19.524 Soc. Psych. I	19.525 Soc. Psych. II	Elective
7th Year	10.327 Mathematics I	10.328 Mathematics II	10.329 Mathematics III
	22.516 Public Admin. I	22.517 Public Admin. II	94.524 Comp. Corr. Systems
	21.534 Social Control	21.547 Social Problems	Elective
	94.593 Sem. Corr. Pract.	Elective	Elective
		Elective	Elective

CORRECTIONAL PRACTICES**Associate in Science Degree****Basic Courses—required**

			quarter hours
19.501,	19.502,	19.503	Psychology I, II, III
**30.601,	30.602		Composition and Rhetoric I, II

6
4 **10**

Core Courses—required

19.541,	19.542,	19.543	Abnormal Psychology I, II, III	6
21.501,	21.502,	21.503	Sociology I, II, III	6
	21.553,	21.554	Racial and Cultural Relations I, II	4
		21.557	Urban Sociology	2
		22.514	American Constitutional Law	2
		22.515	Civil Rights	2

22

Major Concentration Courses—required

94.505		Human Rights in Corrections	2
94.506		Basic Statistics in Law Enforcement	2
94.507		Correctional Counseling	2
94.523		The Law and Institutional Treatment	2
94.532		Research Methods in Criminal Justice	2
94.544		The American Correctional System	2
94.546,	94.547	Social Deviance I, II	4
94.549,	94.550	Treatment of Offenders I, II	4
94.551,	94.552,	Correctional Administration I, II, III	6
	94.563,	Criminology I, II	4
		94.565 Delinquency Prevention	2
	94.567,	94.568 Probation and Parole Practices I, II	4
	94.574,	94.575 Juvenile Corrections I, II	4
	94.627,	94.628 Administration of Justice I, II	4
	94.631,	94.632 Criminal Law I, II	4
	94.633,	94.634 Evidence and Court Procedure I, II	4

52

Elective Courses***Total Credits**

12

96

*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses from any other curricula in the University College Catalog. For suggested electives and additional offerings see page 122.

**For new English requirements see explanation on page 209.

CORRECTIONAL PRACTICES

Recommended Course Sequence for the 4-Year Program Leading to the Associate in Science Degree

All new students should discuss their program with an adviser before undertaking the following sequence of courses:

	Quarter 1	Quarter 2	Quarter 3
1st Year	30.601 Comp. & Rhet. I 94.627 Admin. of Justice I 94.631 Criminal Law I 94.633 Evid. & Ct. Proc. I	30.602 Comp. & Rhet. II 94.628 Admin. of Justice II 94.632 Criminal Law II 94.634 Evid. & Ct. Proc. II	94.505 Human Rts. in Corr. 94.544 Amer. Corr. Sys. 94.523 Law & Inst. Treat. Elective
2nd Year	19.501 Psychology I 94.546 Soc. Deviance I 94.567 Prob. & Par. Prac. I 94.574 Juvenile Corr. I	19.502 Psychology II 94.547 Soc. Deviance II 94.568 Prob. & Par. Prac. II 94.575 Juvenile Corr. II	19.503 Psychology III Elective 94.507 Corr. Counseling
3rd Year	21.501 Sociology I 94.549 Treat. Offenders I 19.541 Abnorm. Psych. I 22.514 Amer. Const. Law	21.502 Sociology II 94.550 Treat. Offenders II 19.542 Abnorm. Psych. II 22.515 Civil Rights	21.503 Sociology III 94.506 Basic Stats. in L. E. 19.543 Abnorm. Psych. III 94.532 Res. Meth. Crim. Just.
4th Year	94.563 Criminology I 21.553 Rac. & Cul. Rel. I 94.551 Corr. Admin. I Elective	94.564 Criminology II 21.554 Rac. & Cul. Rel. II 94.552 Corr. Admin. II Elective	94.565 Del. Prevention 21.557 Urban Sociology 94.553 Corr. Admin. III Elective

LAW ENFORCEMENT**Bachelor of Science Degree**

Basic Courses—required		quarter hours
**10.327, 10.328, 10.329	Mathematics I, II, III	6
19.501, 19.502, 19.503	Psychology I, II, III	6
23.501, 23.502, 23.503	Western Civilization I, II, III	6
*30.601, 30.602	Composition and Rhetoric I, II	4
30.604, 30.605	Introduction to Literary Forms I, II	4
39.501, 39.502, 39.503	Economic Principles and Problems I, II, III	6
		32
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Core Courses—required		
19.524, 19.525	Social Psychology I, II	4
19.541, 19.542, 19.543	Abnormal Psychology I, II, III	6
21.501, 21.502, 21.503	Sociology I, II, III	6
	Social Control	2
	Social Problems	2
22.501, 22.502, 22.503	Principles of Political Science I, II, III	6
	American Constitutional Law	2
	Civil Rights	2
22.516, 22.517	Public Administration I, II	4
23.504, 23.505, 23.506	American History I, II, III	6
26.531, 26.532, 26.533	Ethics I, II, III	6
	Logic	2
29.501, 29.502, 29.503	Effective Speaking I, II, III	6
		54
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*For new English requirements see explanation on page 209.

**94.601, 602, 603, L. E. Mathematics I, II, III, may be taken in place of 10.327, 10.328, 10.329.

Major Concentration Courses—required		quarter hours
	94.506	Basic Statistics in Law Enforcement
94.508,	94.509	Criminal Investigation and Case Preparation I, II
	94.512	Comparative Police Systems
94.514,	94.515	Interviews and Interrogations I, II
94.520,	94.521	Traffic Safety & Control I, II
94.525,	94.526	Law Enforcement Identification and Records I, II
	94.530	Police Public Relations
	94.531	Police Community Relations
	94.532	Research Methods in Criminal Justice
94.536,	94.537	The Patrol Function I, II
94.541,	94.542	Introduction to Criminalistics I, II
94.546,	94.547	Social Deviance I, II
	94.557	Investigative Report Writing
	94.560	Police Supervision
	94.561	Police Work with Juveniles
94.563,	94.564	Criminology I, II
	94.565	Delinquency Prevention
94.571,	94.572	Law Enforcement Management and Planning I, II
	94.621,	Civil Liberties and the Police I, II
94.627,	94.628	Administration of Justice I, II
94.629,	94.630	Civil Law in Criminal Justice I, II
94.631,	94.632	Criminal Law I, II
94.633,	94.634	Evidence and Court Procedure I, II
		74
Elective Courses*		14
Total Credits		174

*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses from any other curricula in the University College Catalog. For suggested electives and additional department offerings, see page 122.

LAW ENFORCEMENT

**Recommended Course Sequence for the 7-Year Program
Leading to the Bachelor of Science Degree**

All new students should discuss their program with an adviser before undertaking the following sequence of courses:

	Quarter 1	Quarter 2	Quarter 3
1st Year	30.601 Comp. & Rhet. I 94.627 Admin. of Justice I 94.631 Criminal Law I 94.633 Evid. & Ct. Proc. I	30.602 Comp. & Rhet. II 94.628 Admin. of Justice II 94.632 Criminal Law II 94.634 Evid. & Ct. Proc. II	26.534 Logic 94.530 Police Public Rel. 22.514 Const. Law 22.515 Civil Rights
2nd Year	21.501 Sociology I 94.536 Patrol Funct. I 94.541 Int. Criminalist. I 94.514 Interv. & Interr. I	21.502 Sociology II 94.537 Patrol Funct. II 94.542 Int. Criminalist. II 94.515 Interv. & Interr. II	21.503 Sociology III 94.560 Police Supervision Elective Elective
3rd Year	19.501 Psychology I 94.546 Social Deviance I 94.508 Cr. Inv. Case Prep. I 94.629 Civ. Law Crim. Just. I	19.502 Psychology II 94.547 Social Deviance II 94.509 Cr. Inv. Case Prep. II 94.630 Civ. Law Crim. Just. II	19.503 Psychology III 21.547 Social Problems 94.557 Inv. Report Writing Res. Meth. Crim. Just.
4th Year	94.563 Criminology I 19.541 Abnorm. Psych. I 94.520 Traf. Sfty. & Cont. I 94.621 Civ. Lib. & Police I	94.564 Criminology II 19.542 Abnorm. Psych. II 94.521 Traf. Sfty. & Cont. II 94.622 Civ. Lib. & Police II	94.565 Del. Prevention 19.543 Abnorm. Psych. III 94.512 Comp. Pol. Systems 94.561 Pol. Work w/Juv.

5th Year	26.531 Ethics I 23.504 Amer. History I 94.571 Law Enf. Mgt. & Pl. I 30.604 Intro. to Lit. Forms I	26.532 Ethics II 23.505 Amer. History II 94.572 Law Enf. Mgt. & Pl. II 30.605 Intro. to Lit. Forms II	26.533 Ethics III 23.506 Amer. History III 94.506 Basic Stat. in Law Enf. 94.531 Police Comm. Rel.
6th Year	10.327 Mathematics I 22.501 Prin. Polit. Sci. I 94.525 Law Enf. Id. & Rec. I 19.524 Soc. Psych. I	10.328 Mathematics II 22.502 Prin. Polit. Sci. II 94.526 Law Enf. Id. & Rec. II 19.525 Soc. Psych. II	10.329 Mathematics III 22.503 Prin. Polit. Sci. III Elective 21.534 Social Control
7th Year	39.501 Ec. Prin. & Prob. I 23.501 Western Civ. I 29.501 Effec. Spkg. I 22.516 Public Admin. I	39.502 Ec. Prin. & Prob. II 23.502 Western Civ. II 29.502 Effec. Spkg. II 22.517 Public Admin. II	39.503 Ec. Prin. & Prob. III 23.503 Western Civ. III 29.503 Effec. Spkg. III Elective

LAW ENFORCEMENT**Associate in Science Degree****Basic Courses—required**

			quarter hours
19.501, 19.502, 19.503	Psychology I, II, III		6
**30.601, 30.602	Composition and Rhetoric I, II		4

Core Courses—required

19.541, 19.542, 19.543	Abnormal Psychology I, II, III	6
21.501, 21.502, 21.503	Sociology I, II, III	6
	22.514 American Constitutional Law	2
	22.515 Civil Rights	2
	26.534 Logic	2

Major Concentration Courses—required

94.508, 94.509	Criminal Investigation and Case Preparation I, II	4
94.514, 94.515	Interviews and Interrogations I, II	4
94.520, 94.521	Traffic Safety & Control I, II	4
94.530	Police Public Relations	2
94.531	Police Community Relations	2
94.532	Research Methods in Criminal Justice	2
94.536, 94.537	The Patrol Function I, II	4
94.541, 94.542	Introduction to Criminalistics I, II	4
94.546, 94.547	Social Deviance I, II	4
94.557	Investigative Report Writing	2
94.560	Police Supervision	2
94.561	Police Work with Juveniles	2
94.563, 94.564	Criminology I, II	4
94.565	Delinquency Prevention	2
94.627, 94.628	Administration of Justice I, II	4
94.629, 94.630	Civil Law in Criminal Justice I, II	4
94.631, 94.632	Criminal Law I, II	4
94.633, 94.634	Evidence and Court Procedure I, II	4

Elective Courses*

	10
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Total Credits

	96
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*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses from any other curricula in the University College Catalog. For suggested electives and additional department offerings, see page 122.

**For new English requirements see explanation on page 209

LAW ENFORCEMENT**Recommended Course Sequence for the 4-Year Program****Leading to the Associate in Science Degree**

All new students should discuss their program with their program adviser before undertaking the following sequence of courses.

	Quarter 1	Quarter 2	Quarter 3
1st Year	30.601 Comp. & Rhet. I 94.627 Admin. of Justice I 94.631 Criminal Law I 94.633 Evid. & Ct. Proc. I	30.602 Comp. & Rhet. II 94.628 Admin. of Justice II 94.632 Criminal Law II 94.634 Evid. & Ct. Proc. II	26.534 Logic 94.530 Police Public Rel. 22.514 Const. Law 22.515 Civil Rights
2nd Year	21.501 Sociology I 94.536 Patrol Funct. I 94.541 Int. Criminalist. I 94.514 Interv. & Interr. I	21.502 Sociology II 94.537 Patrol Funct. II 94.542 Int. Criminalist. II 94.515 Interv. & Interr. II	21.503 Sociology III 94.560 Police Supervision Elective Elective
3rd Year	19.501 Psychology I 94.546 Social Deviance I 94.508 Cr. Inv. & Case Prep. I 94.629 Civ. Law Crim. Just. I	19.502 Psychology II 94.547 Social Deviance II 94.509 Cr. Inv. & Case Prep. II 94.630 Civ. Law Crim. Just. II	19.503 Psychology III 94.561 Pol. Work w/Juv. 94.557 Inv. Report Writing 94.532 Res. Meth. Crim. Just.
4th Year	94.563 Criminology I 19.541 Abnorm. Psych. I 94.520 Traf. Sfty. & Cont. I Elective	94.564 Criminology II 19.542 Abnorm. Psych. II 94.521 Traf. Sfty. & Cont. II Elective	94.565 Del. Prevention 19.543 Abnorm. Psych. III 94.512 Comp. Pol. Systems Elective

SECURITY**Bachelor of Science Degree**

Basic Courses—required			quarter hours
**10.327,	10.328,	10.329	Mathematics I, II, III
19.501,	19.502,	19.503	Psychology I, II, III
23.501,	23.502,	23.503	Western Civilization I, II, III
*30.601,	30.602		Composition and Rhetoric I, II
	30.604,	30.605	Introduction to Literary Forms I, II
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III
			6 32
Core Course—required			
19.532,	19.533,	19.534	Industrial Psychology I, II, III
21.501,	21.502,	21.503	Sociology I, II, III
		22.514	American Constitutional Law
		22.515	Civil Rights
	22.516,	22.517	Public Administration I, II
41.501,	41.502,	41.503	Accounting Principles I, II, III
44.501,	44.502,	44.503	Principles of Finance, Principles of Investments, Principles of Insurance and Risk Management
			6
44.514,	44.515,	44.516	Property and Casualty Insurance I, II, III
		45.510	Labor Management Relations
45.570,	45.571,	45.572	Electronic Data Processing I, II, III
		45.620	Industrial Safety
			2 48

*For new English requirements see explanation on page 209.

**94.601, 94.602, 94.603, L. E. Math I, II, III, may be taken in place of 10.327, 10.328, 10.329.

Major Concentration Courses—required

94.508,	94.509	Criminal Investigation and Case Preparation I, II	4
	94.513	Introduction to Industrial Security	2
94.514,	94.515	Interviews and Interrogations I, II	4
	94.516	Security Administration	2
94.525,	94.526	Law Enforcement Identification and Records I, II	4
94.536,	94.537	The Patrol Function I, II	4
94.541,	94.542	Introduction to Criminalistics I, II	4
	94.557	Investigative Report Writing	2
94.563,	94.564	Criminology I, II	4
	94.565	Delinquency Prevention	2
94.571,	94.572	Law Enforcement Management and Planning I, II	4
94.577,	94.578,	Government Security Programs I, II, III	6
	94.582	Document Control	2
	94.583	Industrial Fire Prevention	2
94.584,	94.585	Physical Security I, II	4
	94.586	Retail Security	2
	94.587	Bank Security Measures	2
	94.591	Seminar in Security	2
94.627,	94.628	Administration of Justice I, II	4
94.629,	94.630	Civil Law in Criminal Justice I, II	4
94.631,	94.632	Criminal Law I, II	4
94.633,	94.634	Evidence and Court Procedure I, II	4
			72
Elective Courses*			22
			174

*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses from any other curricula in the University College Catalog. For suggested electives and additional department offerings, see page 122.

**Recommended Course Sequence for the 7-year Program
Leading to the Bachelor of Science Degree**

All new students should discuss their program with their program adviser before undertaking the following sequence of courses:

	Quarter 1	Quarter 2	Quarter 3
1st Year	30.601 Comp. & Rhet. I 94.627 Admin. of Justice I 94.631 Criminal Law I 94.633 Evid. & Ct. Proc. I	30.602 Comp. & Rhet. II 94.628 Admin. of Justice II 94.632 Criminal Law II 94.634 Evid. & Ct. Proc. II	94.513 Introd. Indust. Sec. 94.586 Retail Security Elective Elective
2nd Year	94.514 Interv. & Interr. I 19.501 Psychology I 94.536 Patrol Funct. I 94.584 Phys. Security I	94.515 Interv. & Interr. II 19.502 Psychology II 94.537 Patrol Funct. II 94.585 Phys. Security II	Elective 19.503 Psychology III 94.583 Indust. Fire Prev. 94.516 Security Admin.
3rd Year	21.501 Sociology I 94.508 Cr. Inv. & Case Prep. I 19.532 Int. Indust. Psy. I 94.629 Civ. Law in Crim. Just. I	21.502 Sociology II 94.509 Cr. Inv. & Case Prep. II 19.533 Int. Indust. Psy. II 94.630 Civ. Law in Crim. Just. II	21.503 Sociology III 94.557 Invest. Report Writing 19.534 Int. Indust. Psy. III Elective
4th Year	94.563 Criminology I 45.570 Elec. Data Proc. I 94.577 Gov. Sec. Prog. I 22.514 Amer. Const. Law	94.564 Criminology II 45.571 Elec. Data Proc. II 94.578 Gov. Sec. Prog. II 22.515 Civil Rights	94.565 Del. Prevention 45.572 Elec. Data Proc. III 94.579 Gov. Sec. Prog. III Elective

5th Year	30.604 Intro. to Lit. -Forms I	30.605 Intro. to Lit. Forms II	Elective
	23.501 Western Civ. I	23.502 Western Civ. II	23.503 Western Civ. III
	94.541 Int. Criminalist. I	94.542 Int. Criminalist. II	94.582 Document Control
	94.571 Law Enf. Mgt. & Plan. I	94.572 Law Enf. Mgt. & Plan II	45.510 Labor Mgt. Rel. I
			Elective
6th Year	39.501 Ec. Prin. & Prob. I	39.502 Ec. Prin. & Prob. II	39.503 Ec. Prin. & Prob. III
	41.501 Acctg. Prin. I	41.502 Acctg. Prin. II	41.503 Acctg. Prin. III
	94.525 Law Enf. Id. & Rec. I	94.526 Law Enf. Id. & Rec. II	Elective
	44.501 Prin. of Finance	44.502 Prin. of Invest.	44.503 Prin. of Ins. & Risk Mgmt.
			Elective
7th Year	10.327 Mathematics I	10.328 Mathematics II	10.329 Mathematics III
	44.514 Prop. & Cas. Ins. I	44.515 Prop. & Cas. Ins. II	44.516 Prop. & Cas. Ins. III
	94.587 Bank Sec. Meas.	45.620 Indust. Safety I	94.591 Sem. In Security
	22.516 Public Admin. I	22.517 Public Admin. II	Elective

SECURITY	Associate in Science Degree	
		quarter hours
Basic Courses—required		
19.501, 19.502, 19.503 **30.601, 30.602	Psychology I, II, III Composition and Rhetoric I, II	6 4 10
Core Courses—required		
19.532, 19.533, 19.534 21.501, 21.502, 21.503 22.514 22.515 45.570, 45.571, 45.572	Industrial Psychology I, II, III Sociology I, II, III American Constitutional Law Civil Rights Electronic Data Processing I, II, III	6 6 2 2 2 6 22
Major Concentration Courses—required		
94.508, 94.509 94.513 94.514, 94.515 94.516 94.536, 94.537 94.557 94.563, 94.564 94.565 94.577, 94.578, 94.579 94.583 94.584, 94.585 94.586 94.627, 94.628 94.629, 94.630 94.631, 94.632 94.633, 94.634	Criminal Investigation and Case Preparation I, II Introduction to Industrial Security Interviews and Interrogations I, II Security Administration The Patrol Function I, II Investigative Report Writing Criminology I, II Delinquency Prevention Government Security Programs I, II, III Industrial Fire Prevention Physical Security I, II Retail Security Administration of Justice I, II Civil Law in Criminal Justice I, II Criminal Law I, II Evidence and Court Procedure I, II	4 2 4 4 2 4 2 4 2 4 2 4 2 6 2 4 2 4 2 4 2 4 2 4 2 4 2 4 2 54
Elective Courses*		
	Total Credits	10
		96

*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses from any other curricula in the University College Catalog. For suggested electives and additional department offerings, see page 122.

**For new English requirements see explanation on page 209.

SECURITY

**Recommended Course Sequence for the 4-Year Program
Leading to the Associate in Science Degree**

All new students should discuss their programs with an adviser before undertaking the following sequence of courses:

	Quarter 1	Quarter 2	Quarter 3
1st Year	30.601 Comp. & Rhet. I 94.627 Admin. of Justice I 94.631 Criminal Law I 94.633 Evid. & Ct. Proc. I	30.602 Comp. & Rhet. II 94.628 Admin. of Justice II 94.632 Criminal Law II 94.634 Evid. & Ct. Proc. II	94.513 Intro. Indust. Sec. 94.586 Retail Security Elective Elective
2nd Year	94.514 Interv. & Interr. I 19.501 Psychology I 94.536 Patrol Funct. I 94.584 Phys. Security I	94.515 Interv. & Interr. II 19.502 Psychology II 94.537 Patrol Funct. II 94.585 Phys. Security II	Elective 19.503 Psychology III 94.583 Indust. Fire Prev. 94.516 Security Admin.
3rd Year	21.501 Sociology I 94.508 Cr. Inv. & Case Prep. I 19.532 Int. Indust. Psy. I 94.629 Civ. Law in Crim. Just. I	21.502 Sociology II 94.509 Cr. Inv. & Case Prep. II 19.533 Int. Indust. Psy. II 94.630 Civ. Law in Crim. Just. II	21.503 Sociology III 94.557 Invest. Report Writing 19.534 Int. Indust. Psy. III Elective
4th Year	94.563 Criminology I 45.570 Elect. Data Proc. I 94.577 Gov. Sec. Prog. I 22.514 Amer. Const. Law	94.564 Criminology II 45.571 Elect. Data Proc. II 94.578 Gov. Sec. Prog. II 22.515 Civil Rights	94.565 Del. Prevention 45.572 Elect. Data Proc. III 94.579 Gov. Sec. Prog. III Elective

SUGGESTED ELECTIVES AND ADDITIONAL DEPARTMENT OFFERINGS**Suggested Electives***

94.595	The National Law Enforcement Seminar	3
94.596	Hospital Security	2
94.614	Seminar in Law Enforcement: Interviewing Practicum	2
94.619	Seminar in Law Enforcement: Forensic Laboratory	2
94.617	Seminar in Law Enforcement: Criminal Behavior	2
94.624	Seminar in Law Enforcement: Executive Development	2
94.626	Seminar in Law Enforcement: Data Processing	2
32.509	Conversational Spanish I	3
32.510	Conversational Spanish II	3
32.511	Conversational Spanish III	3

Additional Department Offerings

94.604	Seminar in Law Enforcement: Youth Crime Control	2
94.605	Seminar in Law Enforcement: Victimology	2
94.606	Seminar in Law Enforcement: International Crime Control	2
94.607	Seminar in Law Enforcement: Grantmanship	2
94.608	Seminar in Law Enforcement: Law Enforcement Operational Intelligence	2
94.609	Independent Studies	2
94.610	Seminar in Law Enforcement: Collective Bargaining	2
94.611	Man, Law, and Society I	2
94.612	Man, Law, and Society II	2
94.613	Man, Law, and Society III	2
94.615	Seminar in Law Enforcement: Organized Crime	2
94.616	Seminar in Law Enforcement: Minorities and the Urban Crisis	2
94.618	Seminar in Law Enforcement: Prosecutive Development	2
94.620	Seminar in Law Enforcement: Intervention, Strategies, and Tactics for Law Enforcement (Counseling Techniques)	2
94.623	Seminar in Law Enforcement: Drugs	2
94.625	Seminar in Law Enforcement: Mental Health and the Police	2
94.650	Fire Investigation and Arson I	2
94.651	Fire Investigation and Arson II	2
94.658	Alcohol Problems in Law Enforcement	2
94.652	Law Enforcement Fiscal Management	2
94.653	Massachusetts Criminal Law	2

*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses from any other curricula in the University College catalog.

health professions programs

**Helene A. Loux, Associate Dean
Director, Health Professions Programs
Telephone 437-3321**

Aims

Programs in Health Sciences are offered through University College in order to help mature students improve their educational preparation for advancement and service in hospitals and other health agencies through part-time study.

In addition to offering courses in the liberal arts and in business administration, specialized courses for particular categories of health personnel are offered when such offerings are justified in terms of community and student need. The unique resources of the Boston area as a medical center offer excellent support facilities for these health-related programs.

Degree programs, both associate and baccalaureate, are designed to provide professional specialization and general cultural development. All programs are designed to meet the accreditation standards of the Council on Medical Education of the American Medical Association and of licensing or registration boards where such exist.

Course Distribution

While students will graduate from the programs in health science prepared to assume a position in the health profession of his choice, and in which he has specialized, it is the goal of Northeastern University that graduates will have a balanced educative background. To this end, the following curriculum design will be in effect for most programs.

Professional and Professionally Related	35-50%
Basic and Allied Sciences	25-40%
Liberal Arts (non-science)	25-40%

Students will choose electives to fulfill course distribution requirements and to equal the number of credits required for the specific degree.

Clinical Assignments

Clinical assignments are available for students whose program requires directed applied study in a clinical setting. In most instances didactic information is presented at the University while clinical practice is at various hospitals or other health agencies in the Greater Boston community. Academic credit earned during the practicum is applicable in most instances, toward the degree requirement.

Students accepting clinical assignments in hospitals, either as part of their clinical rotations or cooperative assignments, are expected to adhere to hospital dress codes and any other requirements of the hospital, all of which are outside University control.

HEALTH SCIENCE**Bachelor of Science in Health Science Degree**

The Bachelor of Science in Health Science is available to students holding an Associate Degree and/or certification, registration, or licensure (as defined by University regulations) in a specific health profession.

REQUIREMENTS FOR THE DEGREE**DISTRIBUTION REQUIREMENTS**

quarter hours

A. Liberal Arts (non-science)	25–40%	44–70
B. Basic and Allied Science	25–40%	44–70
C. Professional and Professionally-related	35–50%	62–86
D. Electives—to equal	100%	174

A. LIBERAL ARTS

(Non-science)

Required

English

8

30.601, 30.602 or 30.603 Composition and Rhetoric I, II,
(or intensive)
or equivalent

30.604, 30.605 or 30.606 Introduction to Literary Forms I & II
(or intensive)
or equivalent

Humanities

12

(Recommended Courses)

Introduction to Philosophy
Spanish or Other Modern Language
Communications or Speech
Literature
Arts

Social Sciences

12

(Recommended Courses)

Psychology
History
Sociology
Principles of Political Science

Electives

to equal at least 12 quarter hours

12

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44

MANAGEMENT IN HEALTH AGENCIES AND INSTITUTIONS**Bachelor of Science Degree**

Basic Courses—required				quarter hours
10.327,	10.328,	10.329	Mathematics I, II, III	6
19.501,	19.502,	19.503	Psychology I, II, III	6
23.501,	23.502,	23.503	Western Civilization I, II, III	6
	30.601,	30.602	Composition and Rhetoric I, II	4
	30.604,	30.605	Introduction to Literary Forms I, II	4
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6
				32
Core Courses—required				—
<i>Liberal Arts</i>				
18.511,	18.512,	18.513	Biology I, II, III	12*
		19.532	Industrial Psychology	2
21.501,	21.502,	21.503	Sociology I, II, III	6
22.501,	22.502,	22.503	Principles of Political Science I, II, III	6
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6
<i>Literature:</i>				6
<i>Fine Arts:</i>				6
			Art, Music, or Theater Arts	44
<i>Management</i>				
41.501,	41.502,	41.503	Accounting Principles I, II, III	6
44.507,	44.508,	44.509	Corporate Finance I, II, III	6
45.501,	45.502,	45.503	Management and Organization I, II, III	6
	45.511,	45.512	Human Relations in Personnel I, II	4
45.513,	45.514,	45.515	Personnel Management I, II, III	6
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6
				34
<i>Health Care Administration</i>				
		86.502	Hospital Law and Ethics	2
86.504,	86.505,	86.506	Foundations of Medical Science I, II, III	6
		86.507	Medical Terminology	2
In addition, each student will select one of the following sequences:				
86.581,	86.582,	86.583	Hospital Organization and Management I, II, III—OR	{ } 16
86.571,	86.572,	86.573	Long-Term Care Administration I, II, III—OR	
86.521,	86.522	86.522	Public Health I, II 4 and	
		86.511	Personal and Community Health 2	
Elective Courses:				
	<i>Liberal Arts</i>			
	<i>Management</i>			
	<i>From Any Area</i>			
	Total Credits			
				174

Note: In addition to the required coursework, proof of understanding of principles of descriptive statistics must be demonstrated. This requirement may be satisfied by: a) successful completion of the examination on descriptive statistics administered by Northeastern's Center for Programmed Study; or b) completion of the program on descriptive statistics at the Center; or c) completion of the University College course 39.511, Statistics I, with a grade of C or better. This last option may also be included in the elective credits required in this curriculum. This requirement should be satisfied before completion of the first 96 credits of coursework.

A significant number of elective courses are allowed, to permit each student to select, with his adviser, a sequence of courses which will represent examination in some depth of a subject of particular interest. Ordinarily, these courses would not be distributed over more than two subject areas.

MANAGEMENT IN HEALTH AGENCIES AND INSTITUTIONS

Recommended Course Sequence for the 8-Year Program

Leading to the Bachelor of Science Degree

	Quarter 1	Quarter 2	Quarter 3
1st Year	Medical Terminology I Mgmt. & Org. I Math. I	Comp. I Mgmt. & Org. II Math. II	Comp. II Mgmt. & Org. III Math. II
2nd Year	Western Civ. I Acctg. I Biology I	Western Civ. II Acctg. II Biology II	Western Civ. III Acctg. III Biology III
3rd Year	Psych. I Elective Intro. to Lit. Forms I	Psych. II Elective Intro. to Lit. Forms II	Psych. III Elective Hospital Law
4th Year	Ind. Psych. Pers. Mgmt. I Found. Med. Sci. I	Human Rel. I Pers. Mgmt. II Found. Med. Sci. II	Human Rel. II Pers. Mgmt. III Found. Med. Sci. III
5th Year	Econ. I Fine Arts Mgmt. Elective Literature	Econ. II Fine Arts Mgmt. Elective Literature	Econ. III Fine Arts Mgmt. Elective Literature
6th Year	Soc. I E.D.P. I L. A. Elective Corp. Fin. I	Soc. II E.D.P. II L.A. Elective Corp. Fin. II	Soc. III E.D.P. III L.A. Elective Corp. Fin. III
7th Year	Pol. Sci. I Hospital Org., Long-Term C. I, or Pub. Health I	Pol. Sci. II Hospital Org., Long-Term C. II, or Pub. Health II	Pol. Sci. III Hospital Org., Long-Term C. III, or Per. Comm. Health
8th Year	Elective Elective Elective Phil. I Elective Elective	Elective Elective Elective Phil. II Elective Elective	Elective Elective Elective Phil. III Elective Elective

NURSING HOME ADMINISTRATION CERTIFICATE PROGRAM

Under the Social Security Law—Title XIX, programs for the licensure of nursing home administrators must be available in each state. In order to provide the educational preparation required by Title XIX and to meet the immediate needs of long term care and nursing home administrators, while still providing academically structured courses that will apply to a degree program, the following sequence is offered.

19.501,	19.502,	19.503	Psychology I, II, III	6
		19.532	Industrial Psychology	2
41.501,	41.502,	41.503	Accounting Principles I, II, III	6
		45.501	Management and Organization I	2
	45.511,	45.512	Human Relations in Personnel I, II	4
		86.502	Hospital Law and Ethics	2
86.504,	86.505,	86.506	Foundations of Medical Science I, II, III	6
	86.507,	86.508	Medical Terminology I, II	4
86.571,	86.572,	86.573	Long-Term Care Administration I, II, III	6
86.577,	86.578,	86.579	Long-Term Care Administration IV, V, VI	6

Total Credits**44**

Successful completion of this course of study with a quality point average of 2.00 will entitle the student to a letter attesting to this accomplishment and will prepare the student to write the present licensure examination in Massachusetts. The Board of Registration in Nursing Home Administration in Massachusetts will require two years of college level study (four years, part time) by 1975 and a baccalaureate degree by 1978.

Completion of the above described sequence of courses and possession of the letter documenting this fact does not constitute graduation from University College.

Program Consultant:

Robert Lovejoy, M.S.

Executive President, Waltham Hospital

Lecturer in Health Science, Northeastern University

**Course Consultant in Nursing Home
Administration Program:**

Jack Chilnick, M.Ed.

Executive Director, Jewish Rehabilitation

Center for the Aged of the North Shore

Lecturer in Health Science, Northeastern University

MEDICAL RECORD ADMINISTRATION

The Profession

The medical record administrator has varied responsibilities relating to health information systems. He designs systems; he plans, organizes, and directs medical record services; he develops, analyzes, and evaluates medical records and indexes; he cooperates with the medical staff in developing methods for evaluation of patient care; he cooperates with the medical and administrative staff in research projects utilizing health care information; and provides advisory services relating to health information systems on local, national, and international level.

The Medical Record Administration Program leading to a baccalaureate degree has been in effect at Northeastern University since 1966. The professional certification program, open to students already holding baccalaureate degrees and offering the required professional courses was instituted in 1967.

Northeastern University's Programs in Medical Record Administration are approved by the American Medical Association's Council on Medical Education, in collaboration with the Committee on Education and Registration of the American Medical Record Association.

Note: *This program is also offered on a full-time (day) basis.*

The information following refers only to the part-time (evening) program. Further information about this Program and/or information about the Day Program may be obtained by contacting the Allied Health Professions Office, 201 Robinson Hall.

MEDICAL RECORD ADMINISTRATION**Bachelor of Science Degree**

Completion of this program qualifies a student for admission to the professional registration examinations conducted by the American Medical Record Association.

Basic Courses—required

				quarter hours
10.327,	10.328,	10.329	Mathematics I, II, III	6
19.501,	19.502,	19.503	Psychology I, II, III	6
23.501,	23.502,	23.503	Western Civilization I, II, III	6
	30.601,	30.602	Composition and Rhetoric I, II	4
	30.604,	30.605	Introduction to Literary Forms I, II	4
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6 32

Core Courses—required*Liberal Arts:*

18.511,	18.512,	18.513	General Biology and Laboratory I, II, III	12
18.524,	18.525,	18.526	Anatomy and Physiology I, II, III	9
		19.532	Industrial Psychology	2
21.501,	21.502,	21.503	Sociology I, II, III	6
22.501,	22.502,	22.503	Principles of Political Science I, II, III	6
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6
<i>Literature:</i>				English, American or other in translation
				6
<i>Fine Arts:</i>				Art, Music, or Theatre Arts
				6 53

Professional and Professionally-related Courses—required

45.501,	45.502,	45.503	Management and Organization I, II, III	6
	45.511,	45.512	Human Relations in Organizations	4
45.570,	45.571		Electronic Data Processing I, II	4
	86.585		Medical Computer Science	2
				16
		86.502	Hospital Law and Ethics	2
86.504,	86.505,	86.506	Foundations of Medical Science I, II, III	6
	86.507,	86.508	Medical Terminology I, II	4
				12
86.551,	86.552,	86.553	Organization of the Medical Records Department I, II, III	6
86.554,	86.555,	86.556	Medical Record Science I, II, III	12
	85.557,	86.558	Medical Record Science IV, V	8
86.586,	86.587,	86.588	Applied Medical Record Science I, II, II	8
				34

Elective Courses

Liberal Arts	6
From Any Area	22

Total Credits	175
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Candidates who wish to major in this program must be interviewed by the Program Director. Arrangements for this interview may be made through the Allied Health Professions Office, 201 Robinson Hall. No candidate will be considered as matriculated until this requirement has been met.

Note: In addition to the required coursework, proof of understanding of principles of descriptive statistics must be demonstrated. This requirement may be satisfied by: a) successful completion of the examination on descriptive statistics administered by Northeastern's Center for Programmed Study; or b) completion of the program on descriptive statistics at the Center; or c) completion of the University College course 39.511; Statistics I, with a grade of C or better. This last option may also be included in the elective credits required in this curriculum. This requirement should be satisfied before completion of the first 96 credits of coursework.

Recommended Course Sequence for the 8-Year Program Leading to the Bachelor of Science Degree in Medical Records and qualification for examination.

	Quarter 1	Quarter 2	Quarter 3
1st Year	Comp. and Rhet. I Mgmt. & Org. I Math. I	Comp. and Rhet. II Mgmt. & Org. II Math. II	Elective Mgmt. & Org. III Math. III
2nd Year	West. Civ. I Gen. Biol. & Lab. I Elective	West. Civ. II Gen. Biol. & Lab. II Elective	West. Civ. III Gen. Biol. & Lab. III Elective
3rd Year	Psych. I Anat. & Physiol. I Med. Termin. I Lit. I	Psych. II Anat. & Physiol. II Med. Termin. II Lit. II	Psych. III Anat. & Physiol. III Hospital Law Elective
4th Year	Literature Soc. I Ind. Psych. Found. Med. Sci. I	Literature Soc. II Human Rel. I Found. Med. Sci. II	Literature Soc. III Human Relations II Found. Med. Sci. III
5th Year	Econ. I Fine Arts Med. Rec. Sci. I	Econ. II Fine Arts Med. Rec. Sci. II	Econ. III Fine Arts Med. Rec. Sci. III
5th Year	Med. Rec. Sci. IV*	Med. Rec. Sci. V*	Electives
7th Year	Electives Pol. Sci. I Org. Med. Rec. I L.A. Elective	Electives Pol. Sci. II Org. Med. Rec. II L.A. Elective	Pol. Sci. III Org. Med. Rec. III L. A. Elective Elective
8th Year	Phil. I E.D.P. I Elective Applied Med. Rec. Sci. I	Phil. II E.D.P. II Elective Applied Med. Rec. Sci. II	Phil. III Med. Comp. Sci. Elective Applied Med. Rec. Sci. III

*Required clinical experience hours must be arranged in relation to courses starred.

MEDICAL RECORDS**Certification Program**

Candidates who wish to qualify for admission to the professional examination leading to registration as a Medical Record Administrator, RRA, and who already hold a baccalaureate degree in another field of study from a college or university acceptable to Northeastern University, may undertake the following course work. Successful completion of this course sequence with a cumulative point average of 2.00 will lead to certification from University College that the candidate has completed a professional program in Medical Records Science.

Courses required for Professional Certification:

			quarter hours
18.524,	18.525,	18.526 Anatomy and Physiology I, II, III	9
45.501,	45.502,	45.503 Management and Organization I, II, III	6
		86.502 Hospital Law and Ethics	2
86.504,	86.505,	86.506 Foundations of Medical Science I, II, III	6
	86.507,	86.508 Medical Terminology I, II	4
86.554,	86.555,	86.556 Medical Record Science I, II, III	12
	86.557,	86.558 Medical Record Science IV, V	8
86.551,	86.552,	86.553 Organization of the Medical Records Department I, II, III	6
	45.570,	45.571 Electronic Data Processing I, II	4
		86.585 Medical Computer Science	2
86.586,	86.587,	86.588 Applied Medical Records Science, I, II, III	8
Total Credits			67

Candidates who wish to matriculate in this program must be interviewed by the Program Director. Arrangements for this interview may be through the Allied Health Professions Office, 201 Robinson Hall. No candidate will be considered as matriculated until this requirement has been met.

Note: In addition to the required coursework, proof of understanding of principles of descriptive statistics must be demonstrated. This requirement may be satisfied by: a) successful completion of the examination on descriptive statistics administered by Northeastern's Center for Programmed Study; or b) completion of the program on descriptive statistics at the Center; or c) completion of the University College course 39.511, Statistics I, with a grade of C or better. This last option may also be included in the elective credits required in this curriculum. This requirement should be satisfied before completion of the first 96 credits of coursework.

Note: This sequence is available through the evening program only.

MEDICAL RECORD ADMINISTRATION**Recommended Course Sequence for the 3-Year Program****Leading to a Certificate in Medical Record Administration**

This program is open to candidates who hold an acceptable baccalaureate degree only.

Prerequisite: A College-level course in General Biology

	Quarter 1	Quarter 2	Quarter 3
1st Year	Mgmt. & Org. I Anat. & Physiol. I Found. Med. Sci. I Med. Termin. I	Mgmt. & Org. II Anat. & Physiol. II Found. Med. Sci. II Med. Termin. II	Mgmt. & Org. III Anat. & Physiol. III Found. Med. Sci. III
2nd Year	Med. Rec. Sci. I EDP I	Med. Rec. Sci. II EDP II	Med. Rec. Sci. III Hospital Law Med. Comp. Sci.
3rd Year	*Med. Rec. Sci. IV Org. Med. Rec. Dept I Applied Med. Rec. Sci. I	*Med. Rec. Sci. V Org. Med. Rec. Dept II Applied Med. Rec. Sci. II	Org. Med. Rec. Dept III Applied Med. Rec. Sci. III

Hospitals Affiliated as Primary Teaching Units

- Beth Israel Hospital, Boston
- Children's Hospital Medical Center, Boston
- Massachusetts General Hospital, Boston
- New England Medical Center
- Boston Hospital for Women
- Mt. Auburn Hospital, Cambridge

Curriculum Advisory Committee in Medical Record Administration

- Sr. Margaret MacDougall, RRA
- Holyoke Community College
- Janice E. Gardner, RRA
- Nashoba Community Hospital, Ayer
- Joyce Gormley, RRA
- Massachusetts General Hospital, Boston
- Marjorie Gurney, RRA
- Massachusetts Hospital Association, Burlington
- Dorothy Richmond, RRA
- Beth Israel Hospital, Boston
- Susan Winship, RRA
- Northern Essex Community College, Haverhill
- Lillian Liebich, RRA
- North Adams Regional Hospital, North Adams

Northeastern University Representatives**(Ex officio)**

- Rina L. Zamczyk, RRA
- Director, Medical Records Program
- Helene A. Loux, Ph.D.
- Associate Dean for Health Professions
- The College of Pharmacy and Allied Health Professions

^{*}Required clinical experience hours must be arranged in relation to courses starred.

RESPIRATORY THERAPY (full-time)

The Profession

As medical knowledge has advanced and become highly specialized, trained personnel in the fields related to medicine have become important members of the health care team. As members of this team, respiratory therapists support and assist in the effort toward optimum patient care by using a variety of treatments and rehabilitative procedures to help patients with respiratory problems. They work in modern health care facilities with sophisticated respirators, ultrasonic nebulizers, blood gas machines, pulmonary function equipment, and oxygen administering devices.

As physicians rely more and more on specialized techniques and equipment, the respiratory therapist will play an increasingly important role in patient care.

ASSOCIATE DEGREE PROGRAM

The first year of this program may be completed by study on a part-time basis over two or more years. An interview with the program faculty is required prior to registration in 86.591, *Introduction to Respiratory Therapy I*. The candidate who completes this part-time study with a cumulative average "C" or better may then apply for admission directly into the second year full-time program. Entrance to the full-time program is on a competitive basis. The second and third years of the full-time program are spent in alternating academic and co-operative quarters. Each academic quarter includes twelve hours per week of applied study in Respiratory Therapy as well as didactic study, liberal arts, and electives.

Prerequisite: College-Level or College-Preparatory General Biology.

Freshman Year Courses		quarter hours
10.327, 10.328, 10.329	Math I, II, III	6
30.603 (or 30.601 and 30.602) and 30.606 (or 30.603 and 30.604)	Composition & Rhetoric	4
18.524, 18.525, 18.526	Introd. to Lit. Forms	4
19.501, 19.502	Human Anatomy and Physiology	9
86.502	Psychology	4
18.521, 18.522	Hospital Law & Ethics	2
86.591, 86.592, 86.593	Microbiology I, II	8
	Introd. to Respiratory Therapy	12

Suggested Sequence of Courses for Freshman Program

	Quarter I	Quarter II	Quarter III
1st Year	Math Anatomy & Physiol. Psychology	Math Anatomy & Physiol. Psychology	Math Anatomy & Physiol. Hospital Law & Ethics
2nd Year	Comp. & Rhet. Intro. Resp. Therapy Microbiology	Introd. to Lit. Forms Intro. Resp. Therapy Microbiology	Intro. Resp. Therapy

Students completing these courses must now apply to the full-time program in order to complete the requirements for the Associate in Science Degree and for eligibility to write the national examination for registration as a Respiratory Therapist.

Students accepted into the full-time day program will follow the basic college curriculum in effect at the time of their acceptance.

Medical Advisory Committee

Leonard Bushnell, M.D., Beth Israel Hospital

Dean S. Crocker, M.D., Children's Hospital Medical Center

John Hedley-Whyte, M.D., Beth Israel Hospital

Henning Pontoppidan, M.D., Massachusetts General Hospital

LeRoy Van Dam, M.D., Peter Bent Brigham Hospital

Academic Representatives (Ex Officio)

Dean Crocker, M.D., Medical Consultant

Evelyn L. Cassara, B.S., R.N., A.R.I.T., Program Director

Helene A. Loux, Ph.D., Assoc. Dean for Health Professions, College of Pharmacy and Allied Health Professions

MEDICAL LABORATORY SCIENCE—CYTO TECHNOLOGY**Bachelor of Science Degree or Associate in Science Degree****The Profession**

Cytotechnology is a speciality in the broader field of medical laboratory science. Cytotechnologists are employed in pathology laboratories, where they expertly examine slides of cells looking for minute abnormalities which are the early warning signs of cancer and related disease. Cytotechnology occupies a highly important place in clinical medicine, requiring a technologist with highly specialized laboratory training and a sound academic background.

The programs are offered through University College and are conducted in affiliation with the several hospitals which comprise the Boston School of Cytotechnology. The programs lead to the Associate in Science or the Bachelor of Science Degree, which are awarded by University College. Completion of the program qualifies a student for admission to the professional examination conducted by the Board of Registry of the American Society of Clinical Pathologists.

The basic sciences and the general education courses are offered evenings, but the professional courses are offered only full-time, days, in cooperation with the affiliated hospitals. Students planning to enter the professional courses are advised to consult the program coordinator prior to the Winter Quarter preceding entrance to the hospital program.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Basic Mathematics I and II courses (10.330 and 10.331). The Mathematics Placement Test must be taken well in advance of the registration date.

FIRST YEAR

Course Number	Course	quarter hours
10.327, 10.328, 10.329	Mathematics I, II, III or 10.307, 10.308	6
30.603 or 18.511, 87.100	College Algebra & Trigonometry Composition & Rhetoric I, II Biology I, II, III Medical Laboratory Science Orientation 86.541, 86.542	4 12 1 4
	Medical Care and Current Social Problems	

SECOND YEAR

Course Number	Course	quarter hours
18.524, 18.525,	18.526 Human Anatomy & Physiology I, II, III	9
12.544, 12.545,	12.546 General Chemistry I, II, III	6
12.547, 12.548,	12.549 General Chemistry Lab. I, II, III	3
19.501, 19.502,	19.503 Psychology or Principles of Political Science	6
	or Other Social Science Elective	
30.604, 30.605 or	30.606 Introd. to Literary Forms	4
	86.502 Hospital Law and Ethics	2

THIRD YEAR

Course Number	Course	quarter hours
87.101	Basic Medical Lab. Science (Fall)	4
87.102 or	87.542 Hematology	2
18.557, 18.558,	18.556 Genetics I, II and Genetics Lab.	6
18.551, 18.552,	18.553 Histology — Organology I, II, III	6
18.521	Microbiology	4
	Humanities Electives	4

FOURTH YEAR

12 months at an AMA-approved Hospital School of Cytotechnology. Those students admitted to the Boston School of Cytotechnology associated with Northeastern University will take the following courses:

87.508	Introduction to Cytotechnology	2
87.528	Cytopathology I	2
87.538	Cytopathology II	2
87.558	Cytopathology III	2
87.568	Cytogenetics and New Concepts	2
87.598	Special Topics	2
87.608	Seminar: Cytopathology Criteria and Correlations	2
87.518, 87.548,	87.578 Applied Cytology I, II, III, IV	14
	87.618	

Total A.S. Degree 111

FIFTH YEAR

Course Number	Course	quarter hours
86.504, 86.505,	86.506 Foundations of Medical Science	6
11.304, 11.305,	11.306 *General Physics I, II, III	6
	or	
86.581, 86.582,	86.583 Hospital Organization and Management Modern Language or Electives	9

*Students planning to enter graduate school should take 4 quarter hours of Analytical Chemistry and 6 quarter hours of Physics.

SIXTH YEAR

Course Number	Course	quarter hours
12.531, 12.532, 12.533	Organic Chemistry I, II, III, and	6
12.534, 12.535, 12.536	Organic Chemistry Lab. I, II, III	6
86.574, 86.575,	Health, Disease, and Disability	4
29.501, 29.502, 29.503	Effective Speaking	6
	or	
	Other Speech or Communications Course	

SEVENTH YEAR

Course Number	Course	quarter hours
39.501, 39.502, 39.503	Economics, Principles & Problems or Other Social Science Elective	6
86.521, 86.522	Public Health or	4
87.544, 87.545	Epidemiology	
87.588	Cytopathology Seminar	2
	Medical Laboratory Science Education Seminar	2
87.546	Medical Laboratory Science Administration Seminar	2
87.547	Electives	6
	Total B.S. Degree	176

MEDICAL LABORATORY SCIENCE—MEDICAL TECHNOLOGY**Bachelor of Science Degree or Associate in Science Degree****The Profession**

Medical Technology is a most respected and important health profession. The medical technologist works as a professional in close association with pathologists, doctors, and hospital and medical laboratory personnel. Working in a variety of specialized fields such as bacteriology, blood-banking, histology, hematology, biochemistry, and nuclear and radiochemistry, the medical technologist makes important observations necessary for critical diagnosis by the doctor upon early detection and treatment of disease.

The Associate Degree Medical Laboratory Technician likewise is an important member of the health team. His responsibilities are commensurate with his background and he works in close association with medical technologists and pathologists.

The Registered Medical Technologist and the Associate Degree Medical Laboratory Technician are in constant demand in hospital laboratories, clinics, public health agencies, pharmaceutical firms, research foundations, and in the Armed Forces.

The baccalaureate program in Medical Technology (Medical Laboratory Science) is conducted in affiliation with several Hospital Schools of Medical Technology approved by the Council on Medical Education of the American Medical Association. The program leads to a Bachelor of Science degree, which is awarded by University College, and entitles the student to write the registry examination in Medical Technology MT (ASCP) given by the Board of Registry of Medical Technologists of the American Society of Clinical Pathologists.

Students who have appropriate clinical experience may apply to write the AD-MLT (ASCP), Associate Degree Medical Laboratory Technician Examination, upon completion of appropriate courses. University College students will be eligible for an Associate degree upon the completion of the courses indicated in the curriculum below and appropriate applied study.

The basic science and general education courses are offered evenings, but the professional courses are offered only full-time, days, in cooperation with the affiliated hospitals. Students planning to enter the professional courses are advised to consult the program coordinator prior to the Winter Quarter preceding entrance to the hospital program.

The Medical Laboratory Science Professional Courses, numbered 87 , will be offered directly through the College of Pharmacy and Allied Health Professions.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Basic Mathematics I and II courses (10.330 and 10.331). The Mathematics Placement Test must be taken well in advance of the registration date.

FIRST YEAR

Course Number	Course	quarter hours
10.307, 10.308	College Algebra & Trigonometry I, II	8
12.544, 12.545, 12.546	General Chemistry I, II, III	6
12.547, 12.548, 12.549	General Chemistry Lab. I, II, III	3
30.603 or 30.601 & 30.602	Composition and Rhetoric I & II	4
87.100	Medical Laboratory Science Orient.	1
86.541, 86.542	Medical Care and Current Social Problems	4

SECOND YEAR

Course Number	Course	quarter hours
18.511, 18.512, 18.513	Biology I, II, III	12
12.531, 12.532, 12.533	Analytical Chemistry I, II, III	6
12.524, 12.525, 12.526	Analytical Chemistry Lab. I, II, III	6
30.604, 30.605 or 30.606	Introduction to Literary Forms	4

THIRD YEAR

Course Number	Course	quarter hours
18.524, 18.525, 18.526	Human Anatomy and Physiology	9
19.501, 19.502, 19.503	Psychology I, II, III or	6
22.501, 22.502, 22.503	Principles of Political Science or Other Social Science Elective	
86.502	Hospital Law and Ethics	2
18.521, 18.522	Microbiology I, II	8

FOURTH YEAR

Course Number	Course	quarter hours
87.101	Basic Medical Laboratory Science	4
87.102, 87.103	Basic Hematology; Basic Blood Banking	4
87.105	Basic Medical Laboratory Chemistry & Instrumentation	4
87.121	Quality Control	2
	Modern Language or Other Humanities Electives	9

—
Total A.S. Degree 102

Associate degree requirement completed for students who have appropriate applied study, and have completed a minimum of 102 quarter hours of credit including those courses listed above.

FIFTH YEAR

Course Number	Course	quarter hours
39.501, 39.502, 39.503	Economic Principles & Problems I, II, III	6
	or	
	Other Social Science Elective	
12.531, 12.532, 12.533	Organic Chemistry I, II, III	6
12.534, 12.535, 12.536	Organic Chemistry Lab. I, II, III	6
	Electives (non-science)	6

SIXTH YEAR

Course Number	Course	quarter hours
11.304, 11.305, 11.306	General Physics, I, II, III	6
18.557, 18.558, 18.556	Genetics I, II, & Lab.	6
	Elective	3
29.501, 29.502, 29.503	Effective Speaking	6
	or	
	Other Speech or Communications course	

SEVENTH YEAR

12 months internship at an affiliated AMA-Approved Hospital School of Medical Technology.

	or	
87.202	Hematology-Immunohematology	4
87.201	Pathogenic Microbiology	4
87.205	Clinical Chemistry	4
87.203	Medical Immunology-Serology	2
87.204	Medical Parasitology	2
87.111, 87.112, 87.115	Applied Studies (at hospital)	12
87.190	Undergraduate Research	2
87.221	Medical Laboratory Management	
	or	
87.226	Health Science Education	2
	Total B.S. Degree	179

RADIOLOGIC TECHNOLOGY**Associate in Science Degree**

The program in Radiologic Technology is a joint offering of the University and several area hospitals. The classroom experiences are provided by the University, and the laboratory practicum is conducted at approved Hospital Schools of Radiologic Technology. These are accredited by the Council on Medical Education of the American Medical Association. The Committee on Radiologic Technology Education of the Massachusetts Radiological Society and the Massachusetts Society of Radiologic Technologists serve in advisory capacities concerning curriculum content.

The Radiologic Technologist is a respected member of the allied health team in the diagnostic and therapeutic environment of the clinic or hospital, and an important functionary in the production, quality control, and inspection laboratories of the industrial community. Medically related responsibilities demand effective rapport with internists, surgeons, pathologists, nurses, and laboratory personnel while industrial competency requires close association with metallurgists, production and manufacturing specialists, engineers, and scientists.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Basic Mathematics I and II courses (10.330 and 10.331) and acceptance by an A. M. A. accredited School of Radiologic Technology which is affiliated with Northeastern University.

Have an interview with the Radiological Technology Program Director, Professor Matthew Stevens, 437-2818, 2819.

Be accepted to the affiliated hospital through an interview with the Radiologist.

FIRST YEAR

Two alternating twelve-week terms of full-time didactic study at Northeastern University and two twelve-week terms of full-time radiologic practicum and seminars at the affiliated Hospital Schools.

Didactics — 24 weeks (at Northeastern University)

Course number	Course	quarter hours
10.391, 10.392	Mathematics, A, B	6
18.570, 18.571	Gross Anatomy and General Physiology I, II	6
86.620, 86.621	Radiologic Technology Orientation I, II	4
86.622, 86.623	Radiological Science I, II	8
86.624, 86.625	Principles of Radiology I, II	8
86.626, 86.627	Radiologic Photography & Exposure I, II	8

Practicum — 28 weeks (at Hospital Schools of Radiologic Technology)

86.647	Radiology Practicum	12
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SECOND YEAR

Full-time attendance at the affiliated Hospital Schools of Radiologic Technology (52 wks @ 40 hrs/wk = 2080 hrs)

Students who satisfactorily complete the first and second year of didactics and practicum are eligible to take the American Radiologic Technology examination for certification as a Radiologic Technician (R.T.)

THIRD YEAR

Three Quarters (36 weeks) part-time evening study at University College.

Course Number	Course	quarter hours
18.511, 18.512, 18.513	Biology I, II, III	12
30.601, 30.602	Composition & Rhetoric I, II	4
	English Elective	2
86.614, 86.615, 86.616	Adv. Radiologic Technology I, II, III	6

FOURTH YEAR

19.501, 19.502, 19.503	Psychology I, II, III or	
21.501, 21.502, 21.503*	Sociology I, II, III	6
45.501, 45.502, 45.503	Management & Organization I, II, III	6
86.617, 86.618, 86.619	Radioactive Isotopes & Therapy I, II, III	6
	Humanities Elective I, II, III	6
		—
	Total A.S. degree	100

Qualified students may accelerate completion of the program by enrolling in third or fourth year evening courses during the second internship year upon petition for approval by the Director of Radiologic Technology in University College for the Radiologist in charge of the Hospital School of Radiologic Technology involved.

Please see day school course descriptions for professional courses associated with the A.M.A. Hospital Approved Programs.

*21.601, 21.602 Principles of Sociology I, II (8 q.h.) may be substituted for 21.501, 21.502, 21.503 Sociology I, II, III (6 q.h.)

MEDICAL LABORATORY SCIENCE—HEMATOLOGY**Bachelor of Science Degree****The Profession**

Hematology is a specialty in the broader field of medical laboratory science. Hematology technologists are employed in hospitals and clinical laboratories where they perform specific laboratory tests—including differential cell counts and bone marrow examinations and hemoglobin and hematocrit determinations—which aid in the diagnosis, treatment, and follow up of infections, anemias, and leukemias. The hematology technologist also performs coagulation studies which aid the diagnosis and treatment of bleeding disorders and the treatment of patients on anticoagulant therapy. The modern hematology laboratory is well equipped with electronic instruments which the technologist must operate and maintain. Additional responsibilities include laboratory quality control and associated problem-solving.

The current requirements for categorical certification in hematology are indicated by the Board of Registry of the American Society of Clinical Pathologists as follows:

A candidate for certification in hematology must meet at least one of the following requirements:

1. Certification in Medical Technology by the Board of Registry of the American Society of Clinical Pathologists, plus one year of satisfactory hematology experience in an acceptable laboratory within the three years immediately prior to application.
2. A baccalaureate degree in biological sciences or chemistry from a college or university accredited by a recognized regional accrediting agency plus two years of hematology experience in an acceptable laboratory.

Students should contact the American Society of Clinical Pathologists, Board of Registry, P.O. Box 4872, Chicago, Illinois 60680, for details concerning their eligibility to write the hematology examination.

The curriculum in hematology does not incorporate a clinical or applied study component, but is primarily designed for one who works in this field, giving him the opportunity to earn a baccalaureate degree with a concentration in his area of interest.

FIRST YEAR

Course Number	Course	quarter hours
10.307, 10.308	College Algebra & Trigonometry I, II	8
12.544, 12.545, 12.546	General Chemistry I, II, III	6
12.547, 12.548, 12.549	General Chemistry Lab. I, II, III	3
30.603	Composition & Rhetoric I & II	4
30.606	Introduction to Literary Forms	4
87.100	Medical Laboratory Science Orientation	1

			SECOND YEAR	
Course Number	Course		quarter hours	
18.511, 18.512, 18.513	Biology I, II, III		12	
	Humanities Elective		6	
**12.531, 12.532, 12.533	Analytical Chemistry I, II, III and		6	
12.524, 12.525, 12.526	Analytical Chemistry Lab. I, II, III	{ or equiv.	6	
			THIRD YEAR	
86.502	Hospital Law and Ethics		2	
87.101	Basic Medical Laboratory Science		4	
*87.102, 87.103	Basic Hematology, Basic Blood Banking or Elective		4	
87.105	Basic Medical Laboratory Chemistry and Instrumentation		4	
87.121	Quality Control		2	
18.557, 18.558, 18.559	Genetics		6	
			FOURTH YEAR	
18.524, 18.525, 18.526	Human Anatomy and Physiology, I, II, III		9	
	Social Science Elective		6	
18.521, 18.522, 18.523	Microbiology I, II or		8	
18.520	Med. Microbiology (4) and Elective (4)		8	
			FIFTH YEAR	
87.541, 87.542, 87.543	Morphologic Hematology (Basic Hem. I, II, III)		6	
12.531, 12.532, 12.533	Organic Chemistry I, II, III		6	
12.534, 12.535, 12.536	Organic Chemistry Lab. I, II, III		6	
	Social Science Elective		6	
			SIXTH OR SEVENTH YEAR	
**11.304, 11.305, 11.306	General Physics I, II, III or Elective		6	
87.211	Coagulation		3	
87.213	Immunohematology		2	
87.222	Histochemistry		3	
	New Cell Biology Elective		4	
	Humanities Elective		6	
			SIXTH OR SEVENTH YEAR	
86.574, 86.575	Health, Disease, & Disability or Instrumentation or Electronics Elective		4	
			6	
87.203	Med. Immunology Serology (Intensive)		2	
87.204	Hem. Parasitology		2	
87.190	Undergrad Research		2	
87.547	Med. Lab. Science Adm. Sem.		2	
87.546	Med. Lab. Science Educ. Sem.		2	
	Ed. or Adm. Health Science Elective		6	

Total B.S. Degree 175**Note:** Strongly recommended electives are: Psychology, Economics

*Students with extensive laboratory experience in a hematology laboratory, may be exempt from these courses.

**An. Chem. and Physics recommended for students applying to graduate school.

education

GENERAL OBJECTIVES

The teacher education program in University College is deeply concerned with the quality of those who teach. In the paragraphs that follow, quality is generally described and the several ways of assessing it are outlined.

Objective I: *Every teacher should be broadly educated.*

All students are expected to develop breadth in their program in two ways. First, students will be required to complete certain common course work: social science, United States history, American literature, effective speaking, human development, and English. Second, all students must complete a minimum of 16 credits in each of the following areas: science and mathematics, humanities, and social sciences.

Objective II: *Every teacher should achieve an expertness in some field of knowledge.*

The Teacher Education Program in University College offers an academic major in the field of English. The major is designed to prepare English teachers for the junior or senior high school. It will also provide a basis for specialized graduate study in English as well as in education.

Objective III: *Each teacher should be professionally prepared for the position of his choice.*

In addition to their general education and specialized concentration, all students will share some common professional course work with related out-of-class experience and, in addition, will take course work appropriate to their level or field of teaching. Student teaching during the senior year will serve as an opportunity to apply what has been learned in the previous years. Beginning students will have about two years to estimate their abilities to master college work, to discover the wisdom of their choice of a major field, and to evaluate the strength of their commitment to, and qualifications for, teaching.

Admission Requirements

Important to the future teacher is high ability in the communication skills and adequate strength in the field of special interest. As important as the pattern and quality of an applicant's preparation are the personal qualifications which contribute to success in teaching.

Upon completion of all courses (or their equivalent) listed under Quarters 1-6 on p. 150, students desiring certification must apply to the College of Education* for admission to the professional sequence of the teacher education program. They will be expected to present such evidence as the College of Education shall require. Evaluations will be made on academic aptitude, verbal fluency, interest in working with young people, and emotional maturity. A serious attempt will be made to access these factors in their inter-relationships rather than as isolated phenomena. Students accepted into the professional sequence of the College of Education will be expected to commit themselves to the remaining requirements of the program.

Transfers

Students admitted to advanced standing in University College (see p. 31) may apply for admission to the professional sequence on the basis of satisfactory grades received in courses which are the equivalent of those required for entering Quarter 7 (see p. 150). Credit toward electives may be earned by means of the College Level Examination Program (see p. 32).

GRADUATION REQUIREMENTS

Degrees

University College will award the degree of Bachelor of Science to those who successfully complete the program of preparation for teaching English at the secondary school level.

Quantitative Requirements

The required courses in the curriculum for the teaching of English are listed on a following page. The curriculum requires not less than 173 quarter hours of class work, including one quarter of student teaching. At least 45 quarter hours will be required in education, including student teaching.

Elective Courses

Elective courses, approved by the College of Education adviser, will be selected by the student from among courses in University College, or credit may be earned by means of the College Level Examination Program.

Qualitative Requirements

Students in the Teacher Education Program in University College will be expected to maintain an over-all average of C while doing work of C+ or better in the field of specialization and in the professional sequence in order

*One of the Basic (day) Colleges of Northeastern University

to be recommended for placement. Students are warned that any failure seriously handicaps their records and must be made up at the earliest opportunity.

Graduation with Honor

Candidates of distinctly superior achievement in their academic work will be graduated with honor. Upon special vote of the faculty a limited number of this group may be graduated with high honor or with highest honor. Students must have been in attendance at the University at least six quarters before they may become eligible for honors at graduation.

National Teacher Examinations

All students who plan to make teaching their career will be expected to take the general and special National Teacher Examinations in their senior year.

Programs of Instruction

The teacher education program in University College offers an academic major in the field of English (in grades 7-12). A specimen program is shown on the following page.

Accreditation

Northeastern University's College of Education is accredited by the National Council for Accreditation of Teacher Education. The College is a member of the American Association of Colleges for Teacher Education.

SPECIMEN PROGRAM IN TEACHING OF ENGLISH (IN GRADES 7-12)

This program is designed with the assumption that the student is attending college on approximately a half-time basis.

First Year			Second Year		
QUARTER 1			QUARTER 4		
No.	Course	Cl. q.h.	No.	Course	Cl. q.h.
16.501	Nat. Sci. I	2 2	22.501	Prin. Pol. Sci. I	2 2
23.501	West. Civ. I	2 2	30.605	Intro. to Lit. Forms II	2 2
29.501	Eff. Spkg. I	2 2	50.111	Soc. Sci. I	3 3
30.601	Comp. & Rhet. I*	2 2			
QUARTER 2			QUARTER 5		
No.	Course	Cl. q.h.	No.	Course	Cl. q.h.
16.502	Nat. Sci. II	2 2	22.502	Prin. Pol. Sci. II	2 2
23.502	West. Civ. II	2 2	English Elective		2 2
29.502	Eff. Spkg. II	2 2	50.112	Soc. Sci. III	3 3
30.602	Comp. & Rhet. II	2 2			
QUARTER 3			QUARTER 6		
No.	Course	Cl. q.h.	No.	Course	Cl. q.h.
16.503	Nat. Sci. III	2 2	22.503	Prin. Pol. Sci. III	2 2
23.503	West. Civ. III	2 2	English Elective		2 2
29.503	Eff. Spkg. III	2 2	50.113	Soc. Sci. III	3 3
30.604	Intro. to Lit. Forms I	2 2			
					—
			24	Total Credits	21
					45

Students desiring certification must now apply to the College of Education** for admission to the teacher education program.

Third Year			Fourth Year		
QUARTER 7			QUARTER 10		
No.	Course	Cl. q.h.	No.	Course	Cl. q.h.
23.527	England 500-1603	2 2	23.504	U.S. History I	2 2
26.501	Intro. Phil. I	2 2	30.541	English Lit. I	2 2
30.525	English Language I	2 2	50.121	Hum. Dev. & Learn. I	4 4
39.501	Ec. Prin. & Prob. I	2 2			
QUARTER 8			QUARTER 11		
No.	Course	Cl. q.h.	No.	Course	Cl. q.h.
23.548	England 1603-1815	2 2	23.505	U.S. History II	2 2
26.502	Intro. Phil. II	2 2	26.534	Logic	2 2
30.526	English Language II	2 2	30.542	English Lit. II	2 2
39.502	Ec. Prin. & Prob. II	2 2	Electives		2 2
QUARTER 9			QUARTER 12		
No.	Course	Cl. q.h.	No.	Course	Cl. q.h.
23.549	England Since 1815	2 2	23.506	U.S. History III	2 2
26.503	Intro. Phil. III	2 2	30.543	English Lit. III	2 2
30.527	English Language III	2 2	50.131	Hum. Dev. & Learn. II	4 4
39.503	Ec. Prin. & Prob. III	2 2			
			24		24

*An English placement examination must be taken. If the score is not satisfactory, students should enroll for 30.600. Elements of Composition, a 2 q.h. credit course designed to improve command of written English. Then proceed with 30.601, 602, 603, 604 and a 2 q.h. English elective in Quarter 6.

**One of the Basic (day) Colleges of Northeastern University

Fifth Year**QUARTER 13**

No.	Course	Cl. q.h.
30.522	Intro. Semantics I	2 2
30.544	Amer. Lit. I	2 2
51.135	Anal. Tchng. & Ed. Proc.	4 4

QUARTER 14

No.	Course	Cl. q.h.
30.523	Intro. Semantics II	2 2
30.545	Amer. Lit. II	2 2
	Electives	4 4

QUARTER 15

No.	Course	Cl. q.h.
	Elective	2 2
30.546	Amer. Lit. III	2 2
54.126	Sec. Reading	4 4

24**Sixth Year****QUARTER 16**

No.	Course	Cl. q.h.
30.517	Intermed. Wrtg.	2 2
30.554	Shakespeare I	2 2
50.141	Meas. & Eval.	4 4

QUARTER 17

No.	Course	Cl. q.h.
30.518	Creative Wrtg. I	2 2
30.555	Shakespeare II	2 2
	Electives	4 4

QUARTER 18

No.	Course	Cl. q.h.
30.519	Creative Wrtg. II	2 2
30.556	Shakespeare III	2 2
	Electives	4 4

24**24****Seventh Year****QUARTER 19**

No.	Course	Cl. q.h.
	Sci. or Math. Elec.	2 2
	Art Music or Thea.	
	Art	2 2
50.151	Bckgrnds. Amer. Ed.	4 4

Eighth Year**QUARTER 22**

No.	Course	Cl. q.h.
51.151	Student Teaching	8

8**Total Credits****173****QUARTER 20**

No.	Course	Cl. q.h.
	Sci. or Math. Elec.	2 2
	Art Music or Thea.	
	Art	2 2
	Electives	4 4

QUARTER 21

No.	Course	Cl. q.h.
	Sci. or Math. Elec.	2 2
	Art Music or Thea.	
	Art	2 2
50.143	M&M—English	4 4

24

therapeutic recreation services

for Nursing Home Activity Directors

**Dr. Albert McCay, Consultant
Therapeutic Recreation Services
Telephone 437-3163**

A certification and degree program for nursing home activity directors and others, is being offered by University College. The program is designed to meet the needs of directors of activity in the Commonwealth's nursing homes and the needs of others entering this occupational field in the future.

The part-time program, leading to certification and an Associate degree, will be taught by the distinguished faculty of Northeastern University's Boston-Bouvé College. Courses offered will be in the areas of therapeutic recreation services, the process of aging, arts and crafts, social recreation, geriatric care, utilization of resources, and many other professional courses.

CURRICULUM

I. Certification—25 quarter hours	
	Professional courses
II. Associate Degree—96 quarter hours	
Psychology	2 q.h.
Social Sciences	8 q.h.
Fine Arts	3 q.h.
Speech & Theatre Arts	4 q.h.
English	2 q.h.
Health Care Science	8 q.h.
Professional	51 q.h.
Electives	18 q.h.

THERAPEUTIC RECREATION SERVICES		Associate in Science Degree
Required Courses (Liberal Arts)		quarter hours
19.501	Psychology I	2
21.501, 21.502, 21.503	Sociology I, II, III	6
21.563	Social Gerontology	2
27.541	Drawing I	3
29.501	Effective Speaking I	2
29.511	Introduction to Theatre Arts	2
30.601	Composition and Rhetoric I	2 19
Required Courses (Health Care Services)		
86.571, 86.572, 86.573	Long-Term Care Administration I, II, III	6
86.577	Geriatric Care I	2 8
Required Courses (Therapeutic Recreation Services)		
Note: Twenty five (25) quarter hours of credit in the following professional courses will qualify a student for certification by Boston-Bouvé College:		
63.501	Introduction to Therapeutic Recreation Services	2
63.510	Philosophy of Recreation and Leisure	2
63.521	Recreation Skills I (Social Recreation)	2
63.522	Recreation Skills II (Music Therapy)	2
63.523	Recreation Skills III (Guitar or Auto Harp)	2
63.531	Techniques of Recreation Leadership	2
63.532	Interagency Planning for Community Action	2
63.535	Recreation Skills VI (Special Events and Programs)	2
63.547	Outdoor Education for Handicapped	2
63.549	The Process of Aging	2
63.550, 63.551	Group Dynamics I, II	4
63.552	Leadership and Program for Ill, Aged, and Infirm	2
63.553	Techniques and Resources in Working with Elderly	2
63.555	Therapeutic Recreation for Special Groups	2
63.556	Workshop in Adapted Hospital Recreation	2
63.557	Recreation Activities of Atypical Individuals and Groups	2
63.560	Development and Utilization of Recreation Education Resources	2
63.570, 63.571, 63.572	Arts and Crafts I, II, III	6
63.592	Independent Study	3
63.593	Independent Study	4
63.600	Seminar in Group Dynamics	2 51
Elective Courses*		— 18
Total Credits		— 96

*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses from any other curricula in the University College Catalog.

THERAPEUTIC RECREATION SERVICES
**Recommended Course Sequence for the 4-Year
Program Leading to the Associate in Science Degree**

	Quarter I	Quarter II	Quarter III
1st Year	Process of Aging Arts & Crafts I Group Dynamics I Intro. Ther. Rec. Services	Leadership & Prog. for Ill, Aged, & Infirm Arts & Crafts II Independent Study	Tech. & Resources in working w/Elderly Group Dynamics II Arts & Crafts III Independent Study
2nd Year	Sociology I Rec. Skills I Interagency Planning for Community Action Long-Term Care Admin. I	Sociology II Rec. Skills VI Comp. & Rhet. I Long-Term Care Admin. II	Sociology III Recreation Skills II Psychology I Long-Term Care Admin. III
3rd Year	Geriatric Care I Effective Speaking I Drawing I Elective (1)	Tech. of Rec. Leadership Rec. Skills III Electives (2)	Seminar in Group Dynamics Dev. & Utilization of Rec. Educ. Resources Electives (2)
4th Year	Intro. to Theatre Arts Ther. Rec. for Spec. Groups Electives (2)	Workshop In Adapted & Hosp. Recreation Social Gerontology Outdoor Educ. for Handicapped Elective (1)	Rec. Activities of Atypical Indiv. & Groups Philosophy of Rec. & Leisure Elective (1)

course descriptions

Not all the courses listed in this bulletin will be offered. A final list of those classes to be offered will be contained in the University College Schedule of Courses, which gives the hours, days and location of classes. This schedule is issued prior to the Fall, Winter, Spring, and Summer Quarters.

Abbreviations

Q.H. = Quarter Hours (credit earned)

Cl. = Hours required in class per week

Prereq. = Prerequisite

10—MATHEMATICS (Lincoln College)

Students intending to enroll in Mathematics 10.327 or 10.335 will be given a Mathematics Placement Test during the registration period. A satisfactory score on this test will entitle the student to enroll in course 10.327 or 10.335, while an unsatisfactory score will require that he enroll in the non-credit course 10.330 for additional preparation.

10.301 Introduction to Mathematics I (4 cl., non-credit)

A comprehensive review of high school algebra including: first degree equations, factoring, fractions, fractional equations, ratio and proportion, word problems, and concepts of plane geometry. Prereq. none.

10.302 Introduction to Mathematics II (4 cl., non-credit)

Algebraic operations with complex fractions, mixed expressions, proportions, square roots, radicals, quadratic equations, simultaneous equations, graphs, and fractional zero and negative exponents. The geometry of the right triangle, areas of polygons and circles, and loci problems. Basic slide rule operation. Prereq. 10.301.

10.303 Introduction to Mathematics

An accelerated combination of 10.301 and 10.302. Primarily for day students.

10.307 College Algebra and Trigonometry I (4 cl., 4 q.h.)

Fundamental algebraic operations; radicals and exponents; functions; quadratic equations; variation; binomial expansion. Trigonometric functions of angles in degrees; right triangles. Prereq. Math. Placement Test or 10.302.

10.308 College Algebra and Trigonometry II (4 cl., 4 q.h.)

Logarithms; applications of right triangles; radian measure; trigonometric identities and equations; oblique triangles. Inequalities; complex numbers; roots of polynomial equations. Prereq. 10.307.

10.316 Probability and Statistics I (2 cl., 2 q.h.)

Basic tools, e.g., sets, permutations and combinations; probability and applications. Prereq. 10.308 or 10.329 or 10.335.

10.317 Probability and Statistics II (2 cl., 2 q.h.)

Descriptive statistics, frequency distributions and probability density functions, normal and other distributions. Prereq. 10.316.

10.318 Probability and Statistics III (2 cl., 2 q.h.)

Bivariate distributions, correlation, statistical inference and estimation regression. Prereq. 10.317.

10.320 Calculus I (4 cl., 4 q.h.)

Plane analytic geometry. Differentiation of algebraic functions. Rate, motion, maximum and minimum problems. Derivatives of higher order. Curve sketching. Basics in functions, limits, and continuity. Prereq. 10.308 or 10.329.

10.321 Calculus II (2 cl., 2 q.h.)

Integration of algebraic functions. Integration and differentiation of logarithmic, exponential and trigonometric terms. Calculations of areas, volumes, and length of arc by definite integrals. Prereq. 10.320.

10.322 Calculus III (2 cl., 2 q.h.)

Differentiation and integration of inverse trigonometric functions. Integration by parts, substitution, and tables. The Trapezoidal and Simpson Rules. The application of the differential and integral calculus to the Polar Coordinate System. Vectors in the plane. Indeterminate forms. Prereq. 10.321.

10.323 Calculus IV (2 cl., 2 q.h.)

Vectors in three-dimensional space. Functions of more than one variable. Partial differentiation. Multiple integration. Infinitive series. Taylor's and MacLaurin's Formula. Prereq. 10.322.

10.324 Differential Equations I (2 cl., 2 q.h.)

Vector analysis; matrices and linear algebra. Prereq. 10.323.

10.325 Differential Equations II (2 cl., 2 q.h.)

Ordinary differential equations — standard types of the first order; linear differential equations, especially with constant coefficients. Variation of parameters. Prereq. 10.324.

10.326 Differential Equations III (2 cl., 2 q.h.)

Series solutions of differential equations; Laplace transforms; Fourier series and orthogonal functions. Prereq. 10.325.

10.327 Mathematics I (2 cl., 2 q.h.)

Methods and applications of algebra, graphical techniques. Prereq. Math. Placement Test, 10.331 or 10.302.

10.328 Mathematics II (2 cl., 2 q.h.)

Linear and quadratic equations, exponents and radicals, variation. Prereq. 10.327.

10.329 Mathematics III (2 cl., 2 q.h.)

Review of geometry; topics of trigonometry, introduction to statistics and probability, logarithms. Prereq. 10.328.

10.330 Basic Mathematics I (2 cl., non-credit)

A review of elementary algebra; algebraic expressions and operations, equations, word problems. Prereq. none.

10.331 Basic Mathematics II (2 cl., non-credit)

Further review; operations with polynomials, factoring, fractional expressions, word problems. Prereq. 10.330.

10.332 Mathematics for Business Management I (2 cl., 2 q.h.)

Introduction to mathematics underlying operations research, with emphasis on applications to business management logic, set theory. Prereq. 10.329 or equiv.

10.333 Mathematics for Business Management II (2 cl., 2 q.h.)

Probability and its uses in decision-making under uncertainty; introduction to vector and matrix algebra. Prereq. 10.332 or equiv.

10.334 Mathematics for Business Management III (2 cl., 2 q.h.)

Mathematics of finance, linear programming and optimization techniques, game theory. Prereq. 10.333 or equiv.

10.351 Advanced Mathematics I (Numerical Analysis) (2 cl., 2 q.h.)

Basic methods of numerical analysis — roots by iteration; approximating polynomials and interpolation; least squares fitting; numerical integration; approximate solution of ordinary differential equations — problems employing the electronic computer. Prereq. 09.353 and 10.326.

10.352 Advanced Mathematics II (2 cl., 2 q.h.)

Introduction to partial differential equations, boundary-value problems, Sturm-Liouville systems. Prereq. 10.351.

10.353 Advanced Mathematics III (2 cl., 2 q.h.)

Special topics in analysis. Prereq. 10.352.

10.361 Modern Algebra I (2 cl., 2 q.h.)

Sets; binary operations; mappings; rings, integers, fields; rationals; reals, bases for computer applications; Euclidean algorithm; primes. Prereq. 10.308, 10.329 or 10.335.

10.362 Modern Algebra II (2 cl., 2 q.h.)

Field of complex number; groups; subgroups; polynomial rings; homomorphisms; isomorphisms; ideals. Prereq. 10.361.

10.363 Modern Algebra III (2 cl., 2 q.h.)

Vectorspaces; linear transformations; dependence, independence; dimension applications to engineering, science, and business. Prereq. 10.362.

10.364 Modern Applied Algebra (4 cl., 4 q.h.)

Introduce the language of abstract algebra to the following topics: graphs, finite state machines, programming languages, Boolean Algebra, lattices, coding for communication channels and radar. Look at algebraic theory of linear systems. Prereq. 10.361, 10.362 and 10.363.

10.391 Mathematics — A (3 cl., 3 q.h.)

Methods and applications of algebra; graphical techniques. Linear and quadratic; exponents and radicals. (No credit to students who have passed 10.327, or 10.328, or 10.335). Prereq. Math. Placement Test, 10.302, or 10.331.

10.392 Mathematics — B (3 cl., 3 q.h.)

Variation; review of geometry; topics of trigonometry; introduction to statistics and probability; logarithms. (No credit to students who have passed 10.329.) Prereq. 10.391.

10.401 Foundations of Mathematics I (2 cl., 2 q.h.)

(See General Interest Courses, pages 152-153.)

10.402 Foundations of Mathematics II (2 cl., 2 q.h.)

(See General Interest Courses, pages 152-153.)

10.403 Foundations of Mathematics III (2 cl., 2 q.h.)

(See General Interest Courses, pages 152-153.)

10.421 Calculus — A (4 cl., 4 q.h.)

Applications of derivatives to curve-sketching; antiderivatives; the definite integral, with applications; calculus of non-algebraic functions — logarithmic, exponential, and trigonometric. Calculus of inverse trigonometric functions; techniques of integration; polar coordinates; the conic sections; vectors in a plane; indeterminate forms, L'Hospital's rule. Prereq. 10.320.

10.422 Calculus — B (3 cl., 4 q.h.)

Calculus of functions of several variables, partial differentiation, multiple integrals, infinite series. Vector analysis; matrices and linear algebra. Prereq. 10.421.

10.423 Differential Equations (4 cl., 4 q.h.)

Ordinary differential equations — standard types of the first order; linear differential equations, especially with constant coefficients; Laplace transforms, series solutions of differential equations. Fourier series and orthogonal functions. Prereq. 10.422.

11—PHYSICS (Lincoln College)

11.301 Introductory Physics I (4 cl., non-credit)

A survey of physical principles and theories related to field of mechanics. Emphasis is placed upon the solution of applied problems. Prereq. None.

11.302 Introductory Physics II (4 cl., non-credit)

Extension of principles in mechanics and introduction of concepts in heat, sound, light, electricity, and magnetism. Prereq. 11.301.

11.304 General Physics I (2 cl., 2 q.h.)

Survey of Newtonian mechanics; kinematics and dynamics of particle motion; projectile and circular motion; rotational motion; conservation laws of energy and momentum. Prereq. 10.501 or concurrently.

11.305 General Physics II (2 cl., 2 q.h.)

Temperature; heat energy; mechanical equivalent of heat; wave motion; sound; Doppler's effect; properties of light; simple optical systems. Prereq. 11.304.

11.306 General Physics III (2 cl., 2 q.h.)

Fundamentals of electricity and magnetism; fields; potential; electric current; inductance; capacitance; electromagnetism; a-c and d-c series circuits. Prereq. 11.305.

12—CHEMISTRY

Consultant: Prof. K. Weiss, Chairman, Chemistry Dept. (L.A. College)

Course Coordinator: Prof. F. Boig, (L.A. College)

2.501 Introductory Chemistry I (4 cl., non-credit)

A non-mathematical approach to the concepts of chemistry including matter, elements and compounds, chemical bonding, chemical equations. Prereq. None.

2.502 Introductory Chemistry II (4 cl., non-credit)

A continuation of 12.501, including periodic system, forms of energy, oxidation reduction, solutions, chemical and ionic equilibrium, nuclear reactions, and a brief introduction to organic chemistry. Prereq. 12.501 or equiv.

2.507 Modern Chemistry I (Intro. to Inorganic Chemistry) (2 cl., 2 q.h.)

Fundamental ideas of matter and energy, chemical bonding, chemical energy, water and solutions, colloids, ionic reactions, oxidation and reduction, acidity, radioactivity; all discussed from the viewpoint of recent developments.

2.508 Modern Chemistry II (Intro. to Organic Chemistry), (2 cl., 2 q.h.)

Classes of organic compounds, including hydrocarbons, alcohols, ethers, aldehydes, ketones, carboxylic acids, esters, amines and amides, carbohydrates; including their relationships with modern biology. Prereq. 12.507 or equiv.

2.509 Modern Chemistry III (Intro. to the Chemistry of Living Bodies) (2 cl., 2 q.h.)

Includes fats, proteins, enzymes, chemistry of digestion, and the chemical reactions characteristic of body fluids. Prereq. 12.508 or equiv.

2.515 Biochemistry I (2 cl., 2 q.h.)

The first quarter of a three-quarter course sequence. The sequence will cover introduction to the biochemistry of the cell, including the occurrence, chemistry, and metabolism of carbohydrates, lipids, proteins, and nucleic acids. Prereq. 12.533 or equiv.

2.516 Biochemistry II (2 cl., 2 q.h.)

Continuation of Biochemistry I. Prereq. 12.515 or equiv.

2.517 Biochemistry III (2 cl. 2 q.h.)

Continuation of Biochemistry II. Prereq. 12.516 or equiv.

12.518 Modern Chemistry Laboratory 1 (2 lab, 1 q.h.)

Coordinated with the lecture course, Modern Chemistry I, and deals with the preparation, properties, and reactions of substances discussed. Prereq. 12.507 taken concurrently. (Laboratory fee)

12.519 Modern Chemistry Laboratory II (2 lab, 1 q.h.)

Coordinated with the lecture course, Modern Chemistry II, and deals with the preparation, properties, and reactions of substances discussed. Prereq. 12.518 (or 12.508 taken concurrently). (Laboratory fee)

12.520 Modern Chemistry Laboratory III (2 lab, 1 q.h.)

Coordinated with the lecture course, Modern Chemistry III. Prereq. 12.519 (or 12.509 taken concurrently). (Laboratory fee)

12.521 Analytical Chemistry I (2 cl., 2 q.h.)

Analytical procedures and techniques. The principles of solution chemistry, ionic equilibria, and oxidation potentials applied to solving problems in chemical analysis. Prereq. 12.546 and 12.549 or equiv.

12.522 Analytical Chemistry II (2 cl., 2 q.h.)

Principles and practice of gravimetric and titrimetric methods of analysis. Prereq: 12.521 or equiv.

12.523 Analytical Chemistry III (2 cl., 2 q.h.)

Theory of spectrophotometry, chromatography, and selected electroanalytical methods. Prereq. 12.522 or equiv.

12.524 Analytical Chemistry Laboratory I (3 lab, 2 q.h.)

Qualitative analysis. Separations by chemical means, chemical tests, and spot tests for inorganic ions in solution. Prereq. 12.521 or concurrently or equiv. (Laboratory fee)

12.525 Analytical Chemistry Laboratory II (3 lab, 2 q.h.)

Chemical methods of quantitative analysis. Procedures and techniques of gravimetric and volumetric methods of chemical analysis. Prereq. 12.522 or concurrently, or equiv. (Laboratory fee)

12.526 Analytical Chemistry Laboratory III (3 lab, 2 q.h.)

Instrumental methods of analysis. Instruments and procedures for electrometric and optical methods of chemical analysis. Prereq. 12.525 and 12.523 or concurrently, or equiv. (Laboratory fee)

12.527 Analytical Chemistry. (Lectures and laboratory, 4 q.h., summer term only) Survey of principles and theories of volumetric, gravimetric, and instrumental analysis. Application made in the laboratory with analyses of unknown samples. Prereq. General Chemistry or its equivalent.

12.531 Organic Chemistry I (2 cl., 2 q.h.)

Nature of carbon in organic compounds. General principles of structure, nomenclature, preparation, uses, and reactions, of aliphatic hydrocarbons: alkanes, alkenes, alkynes, dienes, cycloalkanes. Position and geometric isomerism. Introduction to free radical and ionic mechanisms of reactions. Prereq. 12.546 and 12.549 or equiv.

12.532 Organic Chemistry II (2 cl., 2 q.h.)

Structure of benzene, electrophilic aromatic substitution reactions. General principles of structure, nomenclature, preparation, uses, and reactions of the various types of organic compounds, including: alcohols, alkyl and aryl halides, ethers and epoxides, and carboxylic acids. Optical isomerism and introductory chemical kinetics will be discussed. Prereq. 12.531 or equiv.

12.533 Organic Chemistry III (2 cl., 2 q.h.)

Continuation of Chemistry 12.532 with emphasis on the application of chemical conversions to synthetic problems. Functional derivatives of carboxylic acids, sulfonic acids and their derivatives, amines, diazonium compounds, phenols, aldehydes, and ketones. Prereq. 12.532 or equiv.

12.534 Organic Chemistry Laboratory I (3 lab, 2 q.h.)

Co-ordinated with the lecture course, Organic Chemistry I, and deals with the preparation and properties of compounds discussed. Prereq. 12.546 or equiv. and 12.531 or concurrently, or equiv. (Laboratory fee)

12.535 Organic Chemistry Laboratory II (3 lab, 2 q.h.)

Coordinated with the lecture course, Organic Chemistry II, and deals with the preparation and properties of compounds discussed. Prereq. 12.534 or equiv. (Laboratory fee)

12.536 Organic Chemistry Laboratory III (3 lab, 2 q.h.)

Coordinated with the lecture course, Organic Chemistry III, and deals with the preparation and properties of compounds discussed. Prereq. 12.535 or equiv. (Laboratory fee)

12.541 Physical Chemistry I (2 cl., 2 q.h.)

The three states of matter, atomic and molecular forces, physical properties and molecular structure; heat, work, and heat capacity; thermochemistry. Prereq. 10.323, 11.306, and 12.546 plus 12.549 or equiv.

12.542 Physical Chemistry II (2 cl., 2 q.h.)

Thermodynamics, solutions, chemical equilibria, phase diagrams, and chemical kinetics. Prereq. 12.541 or equiv.

12.543 Physical Chemistry III (2 cl., 2 q.h.)

Electrical conductance, electromotive force, ionic equilibria, colloids, quantum theory, and photochemistry. Prereq. 12.542 or equiv.

12.544 General Chemistry I (2 cl., 2 q.h.)

Fundamental concepts; symbols, formulas, and equations; atomic structure and Periodic Law, chemical bonding; oxygen, ozone, and hydrogen; the gaseous state and gram mole volume; the liquid and solid states; water and hydrogen peroxide. Prereq. 10.327 or equiv. or concurrently. (Not open to those students with credit for 12.311 or 12.314.)

12.545 General Chemistry II (2 cl., 2 q.h.)

Solutions, solutions of electrolytes, colloids, oxidation and reduction reactions, periodic properties, halogens, chemical equilibrium, electrochemistry; acids, bases, and salts; sulfur family. Prereq. 12.544, or equiv. (Not open to those students with credit for 12.312 or 12.315.)

12.546 General Chemistry III (2 cl., 2 q.h.)

Ionic equilibrium and weak electrolytes; solubility product principle, hydrolysis. Nitrogen, phosphorus, and their compounds; boron, silicon, and their compounds; alkali and alkaline earth metals, metals of groups III and IV. Nuclear chemistry. Carbon and its compounds. Biochemistry. Prereq. 12.545, or equiv. (Not open to students with credit for 12.313 or 12.316.)

12.547 General Chemistry Laboratory I (2 lab, 1 q.h.)

Coordinated with the lecture course, General Chemistry I, and deals with the preparation and properties of elements and compounds discussed. Prereq. 12.544 or concurrently or equiv. (Not open to those students with credit for 12.314.) (Laboratory fee)

12.548 General Chemistry Laboratory II (2 lab, 1 q.h.)

Coordinated with the lecture course, General Chemistry II, and deals with the preparation and properties of elements and compounds discussed. Prereq. 12.547, or equiv. (Not open to those students with credit for 12.315.) (Laboratory fee)

12.549 General Chemistry Laboratory III (2 lab, 1 q.h.)

Qualitative analysis experiments, including unknown solutions. Prereq. 12.548 or equiv. (Not open to those students with credit for 12.316.) (Laboratory fee)

12.550 Chemistry for the Citizen. (2 cl., 2 q.h.)

The objective of the course is to give the non-science student an appreciation and some knowledge of the role of chemistry in our technological society and in our everyday lives. To provide background for subsequent discussion, important laws and theories relating to matter and its transformations will be reviewed. There will then follow discussion of the chemistry of such basic human needs as food, clothing, shelter, transportation, and energy production. Other topics may be included or substituted, since students will participate in the selection of subjects for discussion. Prereq. none.

12.551 Instrumental and Radiochemistry I (2 cl., 2 q.h.)

Definitions, physical principles, scope and application; principles of measurement; endpoint-detection systems for volumetric analysis, data treatment and interpretation. Optical methods of analysis including spectrophotometry, excitation methods, measurements of other optical properties, and mass spectrometry. Prereq. 12.523 or equiv.

12.552 Instrumental and Radiochemistry II (2 cl., 2 q.h.)

Methods of separation, vapor phase chromatography, ion exchangers; electrical methods of analysis including potentiometry, voltammetry, coulometry, and conductimetry; miscellaneous instrumental measurements. Prereq. 12.551 or equiv.

12.553 Instrumental and Radiochemistry III (2 cl., 2 q.h.)

Radioactivity and nuclear reactions, production and study of nuclear reactions, equations of radioactive decay, nuclear states and radioactive processes, interaction of radiation with matter, radiation detection and measurement, statistics of radioactivity measurements, techniques for the study of radioisotopes, tracers in chemical applications and nuclear energy. Prereq. 12.552 or equiv.

12.554 Physical Chemistry Laboratory I (3 cl., 2 q.h.)

Experimental studies of viscosity, thermochemistry, and homogeneous equilibrium. Prereq. 12.542 or concurrently or equiv. (Laboratory fee)

12.555 Physical Chemistry Laboratory II (3 cl., 2 q.h.)

Experimental studies of phase equilibrium, solution thermodynamics and chemical kinetics. Prereq. 12.554 or equiv. (Laboratory fee)

16—EARTH SCIENCE

Consultant: Prof. D. Wilmarth, Earth Sciences (L.A. College)

6.501 Introduction to Earth Sciences I (2 q.h.)

The nature and role of the sciences of the Earth; the investigations that have provided information of the Earth as an object in space; our conceptions of the dynamic nature of the Earth. Prereq. none.

6.502 Introduction to Earth Science II (2 q.h.)

The issue of energy; the significance of energy for the dynamics of the Earth's atmosphere, oceans, and land surfaces. Prereq. 16.501 or equiv.

6.503 Introduction to Earth Science III (2 q.h.)

The complex activities of the Earth's crust; the consequences of crustal dynamics, both internally and externally; the history of the dynamics of crustal activity; the origin of the earth; structure and origin of the Solar System; the components of the Universe. Prereq. 16.502 or equiv.

6.504 Earth Science (Intensive) (6 q.h.)

A composite of 16.501, 16.502, 16.503 as a one quarter course. Prereq. one.

6.505 Earth Science A (3 q.h.)

A composite of 16.501 and the first half of 16.502. Prereq. none.

6.506 Earth Science B (3 q.h.)

The second half of 16.502 and all of 16.503. Prereq. 16.505.

6.511 History of Science and Technology I (2 q.h.)

An analysis of the varieties of cultures and civilizations from primitive man to the Roman Empire, emphasizing the interrelationships of science, technology, and society. Prereq. 16.503 or equiv.

6.512 History of Science and Technology II (2 q.h.)

A continuation of History of Science and Technology I covering the period from the Roman Empire to Sir Isaac Newton. Prereq. 16.511.

6.513 History of Science and Technology III (2 q.h.)

A continuation of History of Science and Technology II covering the period from Sir Isaac Newton to the present. Prereq. 16.512.

6.521 Introduction to Geology (2 q.h.)

An introduction to fundamental concepts of the earth and its crust. Consideration of the nature and properties of the materials composing the earth; the areal distribution of these materials, and the processes by which they are formed, altered, transported, and deposited; and the nature and development of the landscape. Prereq. 16.503 or equiv.

16.522 Economic Mineralogy (2 q.h.)

Introduction to the geological occurrence, mineralogy, use and economics of the more important metallic and non-metallic minerals in the world today. International mineral problems will be discussed. Prereq. 16.503 or equiv.

16.523 Gemology (2 q.h.)

Introduction to the precious and semiprecious minerals of the earth's crust. Techniques of gem cutting, polishing, and faceting will be discussed in detail. Opportunity will be available to view and handle actual gem stones. Prereq. 16.503 or equiv.

16.531 Oceanology I (formerly Oceanography I) (2 q.h.)

Introduction to the origin of the global ocean; the physical and chemical properties of sea water; development of ocean currents and their effect on land masses of the world; problems of ocean pollution. Prereq. 16.503 or equiv.

16.532 Oceanology II (formerly Oceanography II) (2 q.h.)

The habitat zones and organisms of the sea; Phytoplankton, zooplankton, and nekton; economic importance of marine resources for expanding world population. Prereq. 16.531 or equiv.

16.533 Oceanology III (formerly Marine Geology) (2 q.h.)

Physiography and structure of ocean basins; marine geological processes and features; sedimentation, erosion, shorelines, and bottom topography; methods and techniques of marine geological explorations. Prereq. 16.532 or equiv.

16.534 Fisheries Oceanography I (2 q.h.)

Survey of commercially important marine organisms; life and distribution of commercially important seaweed, shellfish, and fishes; population dynamics and fishery potential of the world's oceans; analysis of fishery stocks and sea farming. Prereq. 16.533 or equiv.

16.535 Fisheries Oceanography II (2 q.h.)

Examination of fishery methods and techniques around the world; recent technological advancement. Prereq. 16.534 or equiv.

16.536 Fisheries Oceanography III (2 q.h.)

Commercial products and applications of marine organisms; special emphasis on marine products of commerce from the New England area; chemical, industrial, and dietary applications of marine products. Prereq. 16.535 or equiv.

16.537 Marine Resources I (2 q.h.)

Quantitative and qualitative consideration of energy from the marine environment: current technological developments in the use of tidal power, off-shore oil, natural gas, thermal and nuclear energy from the sea. Prereq. 16.533 or equiv.

16.538 Marine Resources II (2 q.h.)

Food resources of the sea; analysis of world marine food production; marine food technology, conservation, and mariculture. Prereq. 16.537 or equiv.

16.539 Marine Resources III (2 q.h.)

Coastal zone recreational resources: beaches, artificial fishing reefs; shore erosion; SCUBA, boating, sailing, angling and surfing. Prereq. 16.538 or equiv.

16.551 Principles of Astronomy I (2 q.h.)

The nature and scope of astronomy; the geocentric universe; the heliocentric universe; celestial reference systems; time and the calendar; the sun-moon earth system; astronomical instruments. Prereq. 16.503 or equiv.

16.552 Principles of Astronomy II (2 q.h.)

The solar system; the inner planets; the outer minor planets; the outer major planets; the telescopic planets; the asteroid belt; meteors; comets; the sun as a source of energy and center of organization. Prereq. 16.551 or equiv.

16.553 Principles of Astronomy III (2 q.h.)

The triangulation of space; stellar population; star color and motion; star systems; stellar evolution; galaxies. Prereq. 16.552 or equiv.

16.554 Observational Astronomy (3 q.h.)

An introduction to the planets, stars, and constellations that are visible to the naked eye. Lectures, the planetarium, and actual viewing sessions are all used during the course. Primary emphasis will be placed on those stars and constellations easily seen from mid-northern latitudes.

16.557 Celestial Astronomy I (2 q.h.)

A thorough examination of the sun as a typical star; determination of stellar physical properties—the instrumentation and the information: size, mass, density; chemical composition, surface temperature, rotation, axial tilt, distance. Prereq. 16.553 or equiv.

16.558 Celestial Astronomy II (2 q.h.)

Star systems—the visual, telescopic, and spectroscopic doubles; simple star systems; stellar populations; H-R diagrams and stellar evolution; multiple stars; irregular stars; nova; nebulae. Prereq. 16.557 or equiv.

16.559 Celestial Astronomy III (2 q.h.)

Galactic detection; galactic distribution; forms, types, and possible galactic evolution; the MILKY WAY; inter-stellar and intergalactic space; pulsars, quasars, and black holes; cosmology. Prereq. 16.558 or equiv.

16.561 Physical Geography I (2 q.h.)

Physical assessment of the earth as a spheroid; relations with the sun; geographic grid; map projections; illumination of the globe; geographic time studies and moon-tide relationships. Prereq. 16.503 or equiv.

16.562 Physical Geography II (2 q.h.)

Physical weather elements—temperature, pressure, moisture; cyclonic storms; role of weather elements in world climate. Prereq. 16.561 or equiv.

16.563 Physical Geography III (2 q.h.)

The earth's landforms—their formation and description; particular emphasis given to the agents of deposition and erosion: the volcano, the river, the glacier, and ocean waves. Prereq. 16.562 or equiv.

16.567 Human and Cultural Geography (2 q.h.)

Spatial analysis of people throughout the world—their culture, cultural landscapes, cultural history, and cultural ecology; provides for an understanding of differences in world populations. Prereq. 16.563 or equiv.

16.568 Urban Geography I (2 q.h.)

In-depth analysis of historical and present structure of cities; comparative world urbanism trends; historic city growth patterns; morphology; site and situations; central place theories; external and internal relations; economic base. Prereq. 16.567 or equiv.

16.569 Urban Geography II (2 q.h.)

An applied approach to urban problems through urban theories and planning techniques; vertical classification of cities; methods of city development; land utilization; land-use survey and mapping techniques; planning approaches; zoning. Prereq. 16.568 or equiv.

16.571 Conservation I (2 q.h.)

Philosophy of conservation; historical development of the conservation movement in the U.S. since 1900; interactions of economics and conservation practices. Prereq. 16.503 or equiv.

16.572 Conservation II (2 q.h.)

Problems relating to the supply, use, and management of major renewable natural resources: forests, soil, wildlife, and water. Prereq. 16.571 or equiv.

16.573 Conservation III (2 q.h.)

Application of the theories and techniques of conservation; problems of urban resources; air and water pollution; recreational resources; the availability of funds. Prereq. 16.572 or equiv.

16.574 Conservation and the Nation (2 q.h.)

In-depth study of the current practices and problems in our nation; mineral resources availability and allocation; energy resources; atmospheric, fresh and salt water pollution; wildlife and endangered species. Prereq. 16.573 or equiv.

16.575 Conservation and the Community (2 q.h.)

Examination of the conservation problems at the local level; identification of the problem; the factors involved; the dimension of the problem; the responsibility of the community. Prereq. 16.574 or equiv.

16.576 Conservation Management (2 q.h.)

Assessment of current practices of the local community; sources of knowledge and assistance among the populace; agencies available to the community; nature and scope of practices needed; practicality of community action. Prereq. 16.575 or equiv.

16.577 Environmental Conservation I (2 q.h.)

Identification of the natural resources of the land; history of the discovery and use of natural land resources; the scientific, social, and political uses of natural resources. Prereq. 16.573 or equiv.

16.578 Environmental Conservation II (2 q.h.)

The physical, chemical, and biological significance of the atmosphere; factors that are removed, added or altered; the economic practices of the urban, suburban, and rural communities; modern methods of detection of atmospheric pollutants; modern techniques and practices designed to deal with the problem. Prereq. 16.577 or equiv.

16.579 Environmental Conservation III (2 q.h.)

An in-depth analysis of the natural resources of the ocean; reclamation of soil; detection and procurement of mineral resources—especially metals and fuel materials; chemical and thermal pollution problems; the biotic resources and their conservation. Prereq. 16.578 or equiv.

16.580 Economic Geography I (2 q.h.)

Theoretical approach and case study examination of spatial manifestations of the economy; spatial models and systems; the economic landscape. Prereq. 16.563 or equiv.

16.581 Economic Geography II (2 q.h.)

Continuation of 16.580—the locational determinants of services, trade, finance, and insurance; transportation and communications; manufacturing, construction, and the extractive industries. Prereq. 16.580 or equiv.

16.582 Applied Climatology (2 q.h.)

Climatic effects on man—his agricultural and economic activities; macroclimatology and microclimatology in rural, suburban and urban situations; short and long range extremes and their climatological consequences. Prereq. 16.581 or equiv.

18—BIOLOGY

Consultant: Prof. F. D. Crisley, Chairman, Biology Dept. (L.A. College)

Course Coordinator: Prof. F. A. Rosenberg (L.A. College)

18.507 Gross Anatomy and General Physiology I (2 cl., 2 q.h.)

Fundamental concepts of living organisms, chemical and biological characteristics of cellular metabolism. The skeletal system and its appendages. General nomenclature, anatomical names and terms. Prereq. none.

18.508 Gross Anatomy and General Physiology II (2 cl., 2 q.h.)

The systems of the body and the relationships between them. The structure and function of each. Prereq. 18.507 or equiv.

18.509 Gross Anatomy and General Physiology III (2 cl., 2 q.h.)

Continuation of the systems of the body and the relationship between them. Prereq. 18.508 or equiv.

18.511 Biology I (General) (3 cl., 3 lab., 4 q.h.)

Universal properties and processes of living organisms. Cellular composition and cellular activities; inheritance and cellular control. Prereq. none. (Laboratory fee)

18.512 Biology II (Animal) (3 cl., 3 lab., 4 q.h.)

Functional anatomy of animal organ systems, their interactions and environmental relationships. Prereq. 18.511 or equiv. (Laboratory fee)

18.513 Biology III (Animal) (3 cl., 3 lab., 4 q.h.)

Systematic comparative study of the structure and functions of animals. Diversity of animals considered from the standpoint of evolutionary adaptation. Prereq. 18.512 or equiv. (Laboratory fee)

18.519 Plant Biology (3 cl., 3 lab., 4 q.h.)

Systematic study of the structure and function of plants, principally vascular plants. Survey of the plant-like protists, and monerans. Prereq. 18.511 or equiv. (Laboratory fee)

18.520 Medical Microbiology (2 cl., 4 lab., 4 q.h.)

Major characteristics of disease-producing organisms. Prereq. A formal course or professional laboratory experience in bacteriology. (Laboratory fee)

18.521 Microbiology I (2 cl., 4 lab., 4 q.h.)

Morphology and biochemistry of the bacteria. Prereq. 18.513 or equiv. (Laboratory fee)

18.522 Microbiology II (2 cl., 4 lab., 4 q.h.)

Survey of pathogenic microorganisms. Prereq. 18.521 or equiv. (Laboratory fee)

18.523 Microbiology III (2 cl., 4 lab., 4 q.h.)

Biology of the protista; the role of microorganisms in the environment and industry. Prereq. 18.522 or equiv. (Laboratory fee)

18.524 Human Anatomy and Physiology I (2 cl., 2 lab., 3 q.h.)

Introduction to human anatomy, osteology, anatomy of the muscular system, respiratory system, digestive system, the vascular system, urogenital system. The laboratory includes a study of human bone and cat dissection. Prereq. 18.506 or 18.513 or equiv. (Laboratory fee)

18.525 Human Anatomy and Physiology II (2 cl., 2 lab., 3 q.h.)

Principles of physiology and continuation of the study of human anatomy. The laboratory is mainly concerned with muscle physiology. Prereq. 18.524 or equiv. (Laboratory fee)

18.526 Human Anatomy and Physiology III (2 cl., 2 lab., 3 q.h.)

Continuation of the principles of physiology. The anatomy and physiology of the nervous system, physiology of the endocrine system. The laboratory deals with physiology of respiration and the physiology of blood. Prereq. 18.525 or equiv. (Laboratory fee)

18.530 Horticulture (3 q.h.)

The study of the science and art of plants, stressing the use of plants in the home and community. Prereq. none. (Laboratory fee)

18.531 Cell Biology I (2 cl., 2 q.h.)

Chemical composition of cells, structure of cells and organelles, transport processes, cell motion and excitability, growth. Prereq. 18.513, 18.556, 18.558 and 12.533 or equiv.

18.532 Cell Biology II (2 cl., 2 q.h.)

Cellular energy supply, enzyme function, respiration and metabolism, photosynthesis and other synthetic pathways, control of cellular processes. Prereq. 18.531 or equiv.

18.533 Cell Biology III (4 cl., 2 q.h.)

Laboratory techniques in cell biology; microscopy, structure and chemical composition of cells, enzyme measurements, photosynthesis, respiration, active transport, growth. Prereq. 18.532 or equiv. (Laboratory fee)

18.535 Advanced Horticulture (3 q.h.)

Prereq. 18.530. (Laboratory fee)

18.551 Histology-Organology I (1 cl., 2 lab., 2 q.h.)

The morphology of cells and tissues. Prereq. 18.513 or equiv. (Laboratory fee)

18.552 Histology-Organology II (1 cl., 2 lab., 2 q.h.)

The tissue components of the integumentary, digestive, and respiratory systems. Prereq. 18.551 or equiv. (Laboratory fee)

18.553 Histology-Organology III (1 cl., 2 lab., 2 q.h.)

The tissue components of the cardiovascular, excretory, reproductive, and endocrine systems. Prereq. 18.552 or equiv. (Laboratory fee)

18.556 Genetics Laboratory (4 lab., 2 q.h.)

Laboratory exercises involving Principles of Mendelian inheritance, linkage, crossing-over. Classical genetics utilizing *Drosophila*; biochemical studies utilizing *Neurospora*. Prereq. 18.558 or equiv. (Laboratory fee)

18.557 Genetics I (2 cl., 2 q.h.)

Mitosis, meiosis, and mendelian genetics. Prereq. 18.513 or equiv.

18.558 Genetics II (2 cl., 2 q.h.)

Chromosome mapping, mutations, translocation, chromosomal aberrations. Prereq. 18.557 or equiv.

18.561 Ecology I (2 cl., 2 q.h.)

Environmental factors. The soil system. Water. The atmosphere. Temperature, light, wind, pressure. The physico-chemical factors — CO₂, N and mineral nutrients. Habitat. Distribution of plants and animals in the world according to temperature and precipitation. Prereq. 18.513 or equiv.

18.562 Ecology II (2 cl., 2 q.h.)

The ecosystem. Ecological niche. The producers, consumers, and decomposers. The pond ecosystem, desert ecosystem, forest ecosystem, and sea shore ecosystem. Energy cycle and efficiency of energy utilization. Mass, weight, and energy pyramids. Prereq. 18.561 or equiv.

18.563 Ecology III (2 cl., 2 q.h.)

Population ecology. Biotic community. Population growth. Relations between the species. Symbiosis. Competition. Predation. Succession. Prereq. 18.562 or equiv.

18.564 Man and His Biosphere I (2 cl., 2 q.h.)

An ecological analysis of the human situation and man's interaction with other organisms. The necessary foundation of biological principles will be presented.

18.565 Man and His Biosphere II (2 cl., 2 q.h.)

A continuation of Man and his Biosphere I. Prereq. 18.564 or equiv.

19—PSYCHOLOGY

Consultant: Prof. M. Terman, Chairman, Psychology Dept. (L.A. College)
Associate Consultant: Prof. H. S. Zamansky (L.A. College)

19.501 Psychology I (2 q.h.)

An introductory survey of the historical backgrounds of psychology, psychological measurement and testing, and principles of animal and human learning.

19.502 Psychology II (2 q.h.)

Principles of sensory processing, perception, motivation and emotion, and social influences on behavior. Prereq. 19.501 or equiv.

19.503 Psychology III (2 q.h.)

Personality theory and measurement, behavior disorders, mental health and psychotherapy. Prereq. 19.502 or equiv.

19.504 Statistics in Psychology I (2 q.h.)

Scales of measurement in psychological research, measures of central tendency, and variability. Prereq. 19.503 or equiv.

19.505 Statistics in Psychology II (2 q.h.)

Measures of correlation, introduction to probability and statistical distributions. Prereq. 19.504 or equiv.

19.506 Statistics in Psychology III (2 q.h.)

Parametric and non parametric tests of significance, including chi square, t-test, F test, and simple analysis of variance. Prereq. 19.505.

Note: 19.504, 19.505, and 19.506 may not be taken in addition to Statistics (39.511, 39.512, 39.513). Psychology majors may substitute 39.511, 39.512, and 39.513 with permission of the Dean.

19.507 Psychology (Intensive) (6 q.h.)

An introductory survey of the historical backgrounds of psychology, psychological measurements and testing, and principles of animal and human learning. Principles of sensory processing, perception, motivation and emotion, and social influences on behavior. Personality theory and measurement, behavior disorders, mental health, and psychotherapy. (Not open to students who have taken 19.501, 19.502, 19.503.)

19.508 Fundamentals of Psychology I (4 q.h.)

Basic concepts from most areas of psychological investigation; the experimental orientation to the study of behavior, including child development, individual differences, learning, and social psychology. (Recommended for psychology majors.) (Not open to students who have credit for 19.501, 502, 503.)

19.509 Fundamentals of Psychology II (4 q.h.)

The sensory basis of behavior, cognition, perception, motivation, emotions, normal and abnormal personality. (Recommended for psychology majors.) Prereq. 19.508 or equiv. (Not open to students who have credit for 19.501, 502, 503.)

19.511 Child Psychology I (2 q.h.)

Genetic factors in development; biological, social, intellectual, and personality development during preschool years. Prereq. 19.503 or equiv.

19.512 Child Psychology II (2 q.h.)

Factors in psychological development during the middle-childhood years. Pre-req. 19.511.

19.513 Adolescent Psychology (2 q.h.)

Psychological and physical changes during adolescence, attitudes toward peer groups and parental figures, vocational choice, and the determination of moral standards and values. Prereq. 19.512 or equiv.

19.521 Personality I (2 q.h.)

Systematic study of the normal personality. A number of prominent theoretical approaches to personality will be considered including the psychoanalytic, constitutional, field, and behavioral-response. Prereq. 19.503 or equiv.

19.522 Personality II (2 q.h.)

Problems of adjustment, frustration, conflict, and stress. Adjustive behavior, mechanisms of defense, and minor personality maladjustments will be considered. Prereq. 19.521 or equiv.

19.523 Motivation (2 q.h.)

Survey of the various aspects of motivation. Such areas as primary and secondary reinforcement, unconscious motivation, effectance motivation, and the assessment of motive will be considered. Prereq. 19.522 or equiv.

19.524 Social Psychology I (2 q.h.)

The socialization process, social motives, interpersonal perception, group membership and structure. Prereq. 19.503 or equiv.

19.525 Social Psychology II (2 q.h.)

Attitudes, prejudice and ethnic relations, leadership, mass behavior and social movements, and the effects of mass media of communication. Prereq. 19.524 or equiv.

19.526 Psychology of Aggression (2 q.h.)

The role of aggressive and violent behavior in man and lower organisms. The contribution of both learned responses and genetic constitution. Prereq. 19.503 or equiv.

19.527 Psychology of Conformity and Rebellion (2 q.h.)

Psychological factors in conforming or rebellious behavior. Specific attention to psychological motives and attitudes of the individual with respect to decisions on political participation, drugs, sexual behavior, educational policy, and other current social problems. Prereq. 19.503 or equiv.

19.528 Psychological Factors in National and International Conflict (2 q.h.)

A review of the psychological images, dynamics, and decisions in national and international loyalty and hostility. Prereq. 19.503 or equiv.

19.529 Interpersonal Behavior in the Small Group I (2 q.h.)

Participation and observation of personalities and role behaviors in small group interaction. Each student will observe and analyze the behavior of both himself and other group members. *Prereq.* 19.503 or equiv.

19.530 Interpersonal Behavior in the Small Group II (2 q.h.)

Continuation of 19.529. *Prereq.* 19.529 or equiv.

19.532 Industrial Psychology I (2 q.h.)

Psychology as applied to industry, including such topics as history causation of behavior, attitudes, morale, and supervision. *Prereq.* 19.503 or equiv.

19.533 Industrial Psychology II (2 q.h.)

The place of psychological tests in industry, individual differences, leadership, training, design of jobs and practical application of these topics for the student in industry. *Prereq.* 19.532 or equiv.

19.534 Industrial Psychology III (2 q.h.)

Topics studied this quarter include motivation, fatigue, safety, and job turnover as related to industry. Special emphasis given to industrial mental health, counseling, interviewing, and personnel selection. *Prereq.* 19.533 or equiv.

19.535 Psychological Factors in the Creative Process (2 q.h.)

Topics to be analyzed will include definitions of creativity, role of intelligence in creativity, motives for problem solving, creative personalities, the encouragement of creativity in the individual and groups, and computer duplication of creative behaviors. *Prereq.* 19.503 or equiv.

19.536 Psychology of Thought (2 q.h.)

Psychological factors in intuition, imagination, problem solving, information processing, and concept learning. *Prereq.* 19.503 or equiv.

19.537 Psychology of Language (2 q.h.)

The child's acquisition of language, verbal habits, the analysis and measurement of meaning, cultural determinants of linguistic behavior, communication processes, and recent research in psycholinguistics. *Prereq.* 19.503 or equiv.

19.538 Psychology of Learning I (2 q.h.)

The concept of learning will be examined critically on the basis of animal and human studies. Techniques for initiating and maintaining learned behavior will receive detailed attention.

19.539 Psychology of Learning II (2 q.h.)

Continuation of 19.538. *Prereq.* 19.538 or equiv.

19.541 Abnormal Psychology I (2 q.h.)

An introduction of the study of the etiology and dynamics of the abnormal personality. *Prereq.* 19.503 or equiv.

19.542 Abnormal Psychology II (2 q.h.)

The symptomatology and treatment of the neuroses and psychoses. *Prereq.* 19.541 or equiv.

19.543 Abnormal Psychology III (2 q.h.)

Psychosomatic, psychopathic, and organic disorders; varieties of psychotherapy.
Prereq. 19.542 or equiv.

19.544 Abnormal Psychology (Intensive) (6 q.h.)

Same as 19.541, 19.542 and 19.543. Prereq. 19.503 or equiv.

19.546 Psychological Testing I (2 q.h.)

Basic principles of test theory, test administration, and test construction.
Familiarization with representative types of tests. Prereq. 19.506 or equiv.

19.547 Psychological Testing II (2 q.h.)

Continuation of 19.546. Prereq. 19.546 or equiv.

19.551 Experimental Psychology I (2 cl., 2 lab., 3 q.h.)

The methods and techniques for the design, execution, and interpretation of
psychological experiments. Prereq. 19.506 or equiv.

19.552 Experimental Psychology II (2 cl., 2 lab., 3 q.h.)

Laboratory instrumentation and research methodology in the investigation of
sensory and perceptual processes. Prereq. 19.551 or equiv.

19.553 Experimental Psychology III (2 cl., 2 lab., 3 q.h.)

Laboratory instrumentation and research methodology in the investigation of
animal and human learning, motivation, and thought. Prereq. 19.552 or equiv.

19.560 Psychology of Women (2 q.h.)

The examination, in both historical and contemporary context, the body of
knowledge studying woman, her function in social roles and her behavior as
determined genetically, physiologically and psychologically. The research im-
plications, future life styles, roles, and contributions of women.

19.561 Historical Development of Psychology I (2 q.h.)

The historical development of psychology from its philosophical beginnings.
Prereq. two full-year courses in psychology.

19.562 Historical Development of Psychology II (2 q.h.)

Major schools of psychology which have influenced modern psychological
research including functionalism, behaviorism, Gestalt psychology, and psycho-
analysis. Prereq. 19.561 or equiv.

19.563 Historical Development of Psychology III (2 q.h.)

The role of theory in current psychological research. Prereq. 19.562 or equiv.

19.571 Seminar in Psychology (2 q.h.)

Discussion of current problems in psychology. Prereq. 19.553 or equiv.

19.591 Honors Program I (4 q.h.) Prereq. approval of the Dean.**19.592 Honors Program II (4 q.h.)**

Prereq. 19.591.

19.593 Honors Program III (4 q.h.)

Prereq. 19.592.

20—ANTHROPOLOGY

Consultant: (See Sociology)

20.501 Anthropology I (2 q.h.) (formerly Introduction to Physical Anthropology). An introduction to elements of physical anthropology, covering such subjects as the primates, fossil man and evolution, problems of heredity and genetics, problems of race and racial classification, and the bases of cultural behavior.

20.502 Anthropology II (2 q.h.) (formerly Cultural Anthropology I)

An introduction to cultural anthropology covering the nature of culture; methods and theories. Prereq. 20.501 or equiv.

20.503 Anthropology III (2 q.h.) (formerly Cultural Anthropology II)

Characteristic features of the language, family life, rituals, and values of tribal peoples in different parts of the world. Prereq. 20.502 or equiv.

20.521 Culture and Personality (2 q.h.)

A cultural approach integrating concepts of social role, values, personality and socialization, and linguistic considerations. Prereq. 20.503 or equiv.

20.504 Anthropology (Intensive)

Same as 20.501, 502, plus 503.

20.531 Primitive Social Organization (2 q.h.)

The institutions of primitive societies; comparative approaches and functional explanations of a limited number of societies; the dynamics of continuity and change of culture and social organization. Prereq. 20.503 or equiv.

20.532 Primitive Religion (2 q.h.)

A study of religious beliefs and rituals of tribal peoples in many parts of the world, including the origin of religious behavior, the relationship of religious behavior to other aspects of culture, and the psychological factors involved. Prereq. 20.503 or equiv.

20.533 Acculturation (2 q.h.)

An examination of the processes of acculturation in culture contact situations of tribal and non-tribal peoples. Focus is on the role of the individual, and the concepts of personality and values in relation to this process. Prereq. 20.503 or equiv.

20.537 Anthropological Theory (2 q.h.)

A history of major orientations, emphasizing the principal contemporary orientations in the field. Evolutionary approaches, culture area and historical analysis, functionalism, role structure, comparative methods, social relations approaches, and the theory of cognitive structure. Prereq. 20.503 or equiv.

20.541 North American Indian (2 q.h.)

Prehistory of the North American Indian, including the study of aboriginal culture areas, utilizing a comparative analysis of representative Indian tribes and their cultures as the method of study. Family life, religion, warfare patterns, and political organization are described. Prereq. 20.503 or equiv.

20.544 African Peoples and Cultures (2 q.h.)

African geography, prehistory and cultures; the spectrum of cultures ranging from the Pygmy to Ashanti Federation; the family, lineage, clan and tribe as these relate to problems of political and economic change in contemporary Africa. Prereq. 20.503 or equiv.

20.547 Latin American Peoples and Cultures (2 q.h.)

Tribal social systems, traditional values, and institutions of Latin America with particular emphasis on Hispanic America. Prereq. 20.503 or equiv.

20.548 Studying the Family Cross Culturally (2 q.h.)

The course will focus on the formation of differing family systems according to a variety of cultural settings. These will include: the Todas, the Hopi, the Anglo-Saxon, the Kibbutz, and the Baganda.

20.549 Folklore (2 q.h.)

The general nature of folklore and methods employed in its study with emphasis on the behavioral-structural approach.

20.550 Peasant Society and Culture as an Anthropological Problem (2 q.h.)

How are peasant societies distinguished from tribes? In what sense do peasantries compose a general social type, and in what sense can we study peasantries comparatively? The development of the concept of peasantry from its European traditions through its modern uses. Analysis of representative case studies of traditional peasant societies in the non-Western and Western world, and some comparison of these findings to selected contiguous folk or tribal groups. Prereq. 20.503 or 20.602 or equiv.

20.551 The Comparative Study of Changing Peasantries (2 q.h.)

Modern studies of peasant societies from Asia, Europe, Africa, and Latin America will be analysed and compared from several points of view, including differing historical traditions, relations with the world outside, economic, political and social structure, change and modernization, and ideology. Prereq. 20.503 or 20.602 or equiv.

20.552 Eastern European Peasantry in the Modern World (2 q.h.)

An analysis and comparison of selected studies of peasant societies in East-Central and Southeastern Europe from Russia to Greece, encompassing varying forms from the traditional peasant village to collectivized peasant units. Consideration of similarities and differences in historical traditions and world outlook, as well as the impact of modern societies and programs of modernization, under varying forms of socialism and capitalism, upon the internal structure and processes of change within the peasant village. Prereq. 20.503 or 20.602 or equiv.

20.601 Principles of Anthropology I (4 q.h.)

An intensive introduction to elements of physical anthropology covering such subjects as the primates, fossil man and evolution problems of heredity and genetics, problems of race and racial classification, the bases of cultural behavior, and the nature of culture.

20.602 Principles of Anthropology II (4 q.h.)

An intensive introduction to cultural anthropology covering characteristic features of tribal peoples, language, family life, rituals, values, social organization, etc. Prereq. 20.601 or equiv.

20.699 Field Work in Anthropology (6 q.h.)

(Refer to page 82 describing field work courses.)

To be arranged with a departmental field work adviser prior to registration. Prereq. Major in Sociology-Anthropology and completion of 12 credits in Anthropology. (Students may receive credit for only one departmental field work course. Credit for 20.699 precludes credit for 21.699)

21—SOCIOLOGY

Consultant: Prof. Lila Leibowitz, Sociology Dept. (L.A. College)

Coordinator: Prof. M. Garrett, Sociology Dept. (L.A. College)

21.501 Sociology I (2 q.h.)

Basic concepts and theories relating to the study of man as a participant in group life with emphasis on social structure, culture, socialization, and the family.

21.502 Sociology II (2 q.h.)

A continuation of Sociology I with major emphasis on primary groups, associations, social stratification, collective behavior, and population. Prereq. 21.501 or equiv.

21.503 Sociology III (2 q.h.)

A continuation of Sociology II emphasizing a critical analysis of American society with particular attention to problems of social, political, urban, and industrial change. Prereq. 21.502 or equiv.

21.504 Sociology (Intensive) (6 q.h.)

Basic concepts and theories relating to the study of man as a participant in group life with emphasis on social structure, culture, socialization, and the family. Primary groups, associations, social stratification, collective behavior, and population. The major institutional areas, with particular attention to problems of social, political, urban, and industrial change. (Not open to students who have taken 21.501, 21.502, 21.503) Prereq. 30.506.

21.505 Drugs and Society (2 q.h.)

An introduction to the sociology of drugs. Examines social definitions of drugs, conditions of their use, and socialization into drug use. Considers deviant drug use and effects of social control on definitions and use. A range of licit and illicit drugs will be considered but major emphasis will be given to alcohol, marihuana, and heroin.

21.506 Sociology of Religion (2 q.h.)

An examination of the role of religious belief systems and institutions in various societies, ancient and modern, Western and non-Western.

21.507 Sex in Society: The Study of Sex Roles (2 q.h.)

Analysis of historical and contemporary development in how men and women's changing roles are related to the society at large.

21.508 Sociology of Literature (2 q.h.)

A novel approach to novels and other literary productions from lyrics and love songs to sci-fi and films. Sociological analysis of content and contexts.

21.509 Sociology of Socialist Societies (2 q.h.)

Comparative sociology of China, USSR, Cuba, others, focussing on ideology, social organization, economy, polity, education, child care, women's positions, etc. The course will emphasize processes of change and the interrelationships between institutions.

21.512 Social Research Methods I (2 q.h.)

An introduction to social research methods with particular attention to problems of theory and method in both anthropology and sociology. *Prereq. Consent of the Instructor or 12 q.h. in sociology-anthropology.*

21.513 Social Research Methods II (2 q.h.)

A continuation of Social Research Methods I with emphasis on data collection, measurement, and scaling in both anthropology and sociology. *Prereq. 21.512 or equiv.*

21.514 Social Research Methods III (2 q.h.)

A continuation of Social Research Methods II stressing the analysis of data. *Prereq. 21.513 or equiv.*

21.517 Social Theory I (formerly Foundations of Sociological Theory) (2 q.h.)

An historical survey of sociological theorists including the work of de Tocqueville, Comte, Marx, Durkheim, Cooley, and others. *Prereq. Consent of the Instructor or 12 q.h. in sociology-anthropology.*

21.518 Social Theory II (formerly Contemporary Sociological Theory I) (2 q.h.)

A study of major theoretical issues in sociology. Discussion concentrates on systematic questions and topics, as opposed to particular theorists, but material is drawn from theorists such as Weber, Simmel, Thomas, Mannheim, Merton, and Parsons. *Prereq. 21.517 or equiv.*

21.519 Social Theory III (formerly Contemporary Sociological Theory II) (2 q.h.)

A seminar in which the principal focus will be upon questions of theoretical interest, e.g., the problem of order, the problem of change, the role of the individual in change. Students will present their papers in class. *Prereq. 21.518 or equiv.*

21.528 Social Stratification: Class, Status, and Power (2 q.h.)

A comparative study of the nature of class structure with emphasis on the United States and with reference to India and England. Discussion of such topics as theories of class structure, factors determining class membership, differential class behavior, and social mobility. *Prereq. 21.503 or equiv.*

21.531 Social Change (2 q.h.)

An analysis of the changing patterns in social and economic institutions, a discussion of modern social trends, and a review of current literature in a field. Prereq. 21.503 or equiv.

21.534 Social Control (2 q.h.)

The study of group membership as a determinant of behavior, analysis of status and role, patterns of authority, and group ideology as factors in the evaluation of conduct. Prereq. 21.503 or equiv.

21.535 Political Sociology: Who Gets What (2 q.h.)

The social structure of political life emphasizing relationships in the structure of society with its classes, occupations, races, and levels of opportunity as they affect political activity. Prereq. 21.503 or equiv.

21.538 (see 25.538)

21.539 (see 25.539)

21.540 (see 25.540)

21.543 (see 25.543)

21.544 (see 25.544)

21.545 (see 25.545)

21.546 Sociology of Deviant Behavior (2 q.h.)

Analysis of the variety of social problems and their relationship to the organization of society. Particular attention will be given to alcoholism, sex offenses, drug abuse, mental health, and other problems relating to an urban industrial society. Prereq. 21.503 or equiv.

21.547 Social Problems (2 q.h.)

An overview of contemporary American social problems and the application of sociological concepts, methods, and principles to these problems. Prereq. 21.503 or equiv.

21.550 Juvenile Delinquency (2 q.h.)

A study of factors in delinquency and an examination of the implications for prevention, rehabilitation, and treatment. Prereq. 21.503 or equiv.

21.551 Family and Marriage I (2 q.h.)

A comparative and historical treatment stressing the past history and development of the family. Prereq. 21.503 or equiv.

21.552 Family and Marriage II (2 q.h.)

A continuation of Family and Marriage I emphasizing the backgrounds of contemporary problems in the context of functions, forms, and processes of this institution. Prereq. 21.551 or equiv.

21.553 Racial and Cultural Relations I (2 q.h.)

A study of the relationships between various racial, nationality, cultural, and religious groups with emphasis on the historical development of black-white relationships in American society. Prereq. 21.503 or equiv.

21.554 Racial and Cultural Relations II (2 q.h.)

A continuation of Racial and Cultural Relations I stressing the problems of contemporary black-white relationships in both American and other societies. Prereq. 21.553 or equiv.

21.555 Racial and Cultural Relations III (2 q.h.)

A continuation of Racial and Cultural Relations II with specific attention to religious nationality, and non-African racial groups in American and other multi-racial societies. Prereq. 21.554 or equiv.

21.556 Sociology of Poverty (2 q.h.)

An analysis of American poverty in historical perspective, drawing on comparisons with other countries. Critical evaluation of sociological research and theories relating to poverty. Consideration of causes and effects of poverty, as well as societal responses to poverty and its consequences. Suitable for students in applied fields, such as nursing, criminal justice, education, allied health, pre-med, and pre-law.

21.557 Urban Sociology (2 q.h.)

An analysis of the various causes, characteristics, and effects of urbanization in several different cultures of the world. Specific attention is given to the problems of urban and suburban living and the changing structure of the city. Prereq. 21.503 or equiv.

21.558 Community Analysis (2 q.h.)

Ecological theories of man's relation to his physical environment. Development of the concept, and discussion of community study methods. Contrasts between rural communities and urban neighborhoods. Discussion and evaluation of community action programs. Prereq. 21.503 or equiv.

21.559 Seminar in Urban Studies (2 q.h.)

Interdisciplinary approaches to analyses of urban issues, continuing student projects. Prereq. One previous course in urban studies field.

21.560 Medical Sociology (2 q.h.)

Sociological concepts and research relating to the study of patterns of behavior in the areas of health and disease. Emphasis on the family, community, medical organizations, class, and status as social subsystems related to the field of health. Prereq. 21.503 or equiv.

21.561 Sociology of Mental Health

The emphasis of this course will be the sociological aspects of mental health and mental disorder. There will be presentations and discussions of the social history of mental illness, epidemiological and cross-cultural approaches to mental disorder, the career of the mental patient, the functions of psychiatry in society, community and social treatment modalities and other aspects of social psychiatry. Prereq. 21.503 or 21.602 or equiv.

21.563 Social Gerontology: The Aged in Society (2 q.h.)

An examination of social factors involved in aging, with specific reference to how biological and psychological age change influence behavior, social roles, and cultural patterns. The relation of aging to social change, and special provisions for the aged. Prereq. 21.503 or equiv.

21.567 Population (2 q.h.)

The use of demographic methods in the analysis of social structures. Introduction to the use of population size and composition, birth rates, and other demographic data in the comparative analysis of societies. Prereq. 21.503 or equiv.

21.570 Sociology of Occupations and Professions (2 q.h.)

Analysis of the social relations within occupational groups, of occupational structure, and of institutional aspects of an occupation. Relationships of supervisors, peers, colleagues, subordinates, and clientele; their significance for work role behavior. Prereq. 21.503 or equiv.

21.573 Sociology of Industry (2 q.h.)

Comparison of pre-industrial and industrial society, stressing the impact of industry on society and the relationship between industry, culture, and values. Diversification and specialization. Human relations in industry; analysis of subordinate—superordinate behavior, line and staff relationships, and formal and informal groups. Prereq. 21.503 or equiv.

21.575 Sociology of Formal Organizations: Humans, Machines, and Bureaucracy (2 q.h.)

A study of formal organizations and the principles that govern organizational life. Weber's theory of bureaucracy and the concept of authority; communication systems and other conceptions of formal organizations. The structure of work groups and their effect on the larger organization. Prereq. 21.503 or equiv.

21.591 Honors Program I (4 q.h.)

Prereq. approval of Dean.

21.592 Honors Program II (4 q.h.)

Prereq. 21.591.

21.593 Honors Program III (4 q.h.)

Prereq. 21.592.

21.601 Principles of Sociology I (Recommended for Majors) (4 q.h.)

An intensive introduction to basic concepts and theories relating to the study of man as a participant in group life. Emphasis is placed on socialization, culture, social structure, primary groups, family, social stratification, and population.

21.602 Principles of Sociology II (4 q.h.)

A continuation of Principles of Sociology I with emphasis on a critical analysis of American society with particular attention to problems of social, political, urban, and industrial change. Prereq. 21.601 or equiv.

21.612 Social Research Methods I (Intensive) (4 q.h.)

An intensive introduction to social research methods in both anthropology and sociology with particular attention to problems of theory, methods, and data collection. Prereq. Consent of the Instructor or 12 q.h. in sociology-anthropology.

21.613 Social Research Methods II (Intensive) (4 q.h.)

A continuation of Social Research Methods (Intensive) I, with emphasis on data collection, measurement, scaling, and the analysis of data. Prereq. 21.612.

21.617 Social Theory I (Intensive) (4 q.h.)

An historical survey of sociology theorists, including the work of de Tocqueville, Comte, Marx, Durkheim, Cooley, Weber, Simmel, and others. Prereq. Consent of the Instructor or 12 q.h. in sociology-anthropology.

21.618 Social Theory II (Intensive) (4 q.h.)

A study of major theoretical issues in sociology. Discussion concentrates on systematic questions and topics, but material is drawn from theorists such as Mannheim, Merton, Parsons. Students will present papers in class on questions of theoretical interest; e.g., the problem of order, the problem of change, the role of the individual in change, etc.

21.699 Field Work in Sociology (6 q.h.)

(Refer to page 82 describing field work courses.)

To be arranged with a departmental field work adviser prior to registration. Prereq. Major in Sociology-Anthropology and completion of Social Research Methods 21.514 or 21.613. (Students may receive credit for only one departmental field work course. Credit for 21.699 precludes credit for 20.699)

25—SOCIAL WELFARE

Course Coordinator: Prof. Lois Ames (College of Criminal Justice)

25.538 Introduction to Social Welfare I (2 q.h.) (formerly 21.538)

An introduction to the nature and scope of the social welfare institution, its historical development, the effects of urban industrialization, and its relationship to present day American Society.

25.539 Introduction to Social Welfare II (2 q.h.) (formerly 21.539)

A continuation of Introduction to Social Welfare I, with particular attention to the development of social security and the welfare state.

25.540 Introduction to Social Welfare III (2 q.h.) (formerly 21.540)

A continuation of Introduction to Social Welfare II, focusing on selected aspects of the current social welfare system, its attempts to alleviate poverty and other social problems.

25.543 Introduction to Social Work Practice I (2 q.h.) (formerly 21.543)

An introduction to the functions of the helping profession of social work, its settings and methods. Specific techniques such as interviewing, history taking, and recording skills are presented.

25.544 Introduction to Social Work Practice II (2 q.h.) (formerly 21.544)

A continuation of Introduction to Social Work Practice I, with particular attention to the functioning of social workers in selected settings.

25.545 Introduction to Social Work Practice III (2 q.h.) (formerly 21.545)

A continuation of Introduction to Social Work Practice II, with emphasis on enhancement of practice skills.

22—POLITICAL SCIENCE

Consultant: Prof. W. S. Jones, Chairman, Political Science Dept. (L.A. College)

Course Coordinator: Prof. Minton Goldman (L.A. College)

22.501 Principles of Political Science I (2 q.h.)

Evolution of the nation-state. Analysis of basic political concepts. Study of basic forms of the contemporary political system.

22.502 Principles of Political Science II (2 q.h.)

Analysis of constitutional and totalitarian models. Study of contemporary British and Soviet political systems. Prereq. 22.501 or equiv.

22.503 Principles of Political Science III (2 q.h.)

The American political system including study of civil rights. International politics and American foreign policy since 1945. Prereq. 22.502 or equiv.

22.505 Contemporary Political Theory (2 q.h.)

Political ideas and systems of political thought from Machiavelli to the present. Prereq. 22.504 or equiv.

22.506 American Political Thought (2 q.h.)

Political thought from the colonial period to the present including a study of the impact of religious, economic, and judicial theory on the structure of American ideas. Prereq. 22.503 or equiv.

22.507 Principles of Political Science (Intensive) (6 q.h.)

Evolution of the nation-state. Analysis of basic political concepts. Study of basic forms of the contemporary political system. Analysis of constitutional and totalitarian models. Study of contemporary British and Soviet political systems. The American political system including study of Civil Rights. International politics and American foreign policy since 1945. Not open to students who have taken 22.501, 22.502, 22.503, or equiv.

22.508 Research Methods (2 q.h.)

An introduction to some of the most common methods of carrying out research in the discipline of political science. Problems of theory construction, data-gathering, and a selection of analytical research tools including bibliographical aids and the computer are examined.

22.511 American National Government (2 q.h.)

A study of the form and structure of the federal constitution and an analysis of the legislative process at the national level. Prereq. 22.503 or equiv.

22.512 Urban and Metropolitan Government (2 q.h.)

The political, structural, and functional problems of an urbanizing United States, including an analysis of urban, suburban, and metropolitan governments. Prereq. 22.503 or equiv.

22.513 Political Parties and Pressure Groups (2 q.h.)

Party government in the United States and Great Britain. A contrasting study focusing on the interaction of party and government. Prereq. 22.503 or equiv.

22.514 American Constitutional Law (2 q.h.)

A case analysis of the development of federalism, the separation of powers, and the role of the federal and state courts in constitutional development.

22.515 Civil Rights (2 q.h.)

An evaluation of the quality and content of civil liberties in the United States. Emphasis will be placed on the first, fifth, sixth, fourteenth, and fifteenth amendments to The Constitution.

22.516 Public Administration I (2 q.h.)

An introduction to the theory, forms, and processes of administration at the national and state level.

22.517 Public Administration II (2 q.h.)

Selected problems. Case-study approach to examination of relation between the theory and practice of public administration. Prereq. 22.516 or equiv.

22.518 Government and Politics of the States (2 q.h.)

A study of state and local government and problems and the function and operational responses to them.

22.519 The Legislative Process (2 q.h.)

An institutional, functional analysis of the roles of Congress, the executive, and political parties in the legislative process.

22.521 Comparative Government I (2 q.h.)

A comparative analysis of political culture, organization, and behavior in England, France, and Germany. Prereq. 22.503 or equiv.

22.522 Comparative Government II (2 q.h.)

A continuation of 22.521. Prereq. 22.521 or equiv.

22.532 International Organization (2 q.h.)

Development of international organizations with special emphasis on the United Nations, specialized agencies, and regional organizations. Prereq. 22.503 or equiv.

22.533 American Foreign Policy (2 q.h.)

The constitution and political instruments for the formulation of American foreign policy. Prereq. 22.503 or equiv.

22.534 Soviet Foreign Policy (2 q.h.)

A study of the evolution of Soviet foreign policy since 1917 with emphasis on the development of the international Communist movement.

22.535 International Relations (4 q.h.)

Elements and limitations on national power. Contemporary world politics, problems of war and peaceful coexistence. Prereq. 22.503 or equiv. (Not to be taken by students who have credit for 22.531.)

22.536 Introduction to Political Theory (4 q.h.)

Development of the political ideas of the Western world. The major philosophers of Greece, Rome, The Christian Era, and the Renaissance. Prereq. 22.503 or equiv. (Not to be taken by students who have credit for 22.504.)

22.537 European Political Parties (2 q.h.)

A study of political party systems in England, France, and Germany emphasizing ideology, organization in and out of Parliament, electoral strategies, and voter behavior.

22.538 Communist China's Foreign Policy (2 q.h.)

A study of the Peking government's relations with Afro-Asia, the Soviet orbit, and the west. Attention is given to policy objectives, strategy, tactics, and the method of decision making in both the party and state apparatus.

22.541 International Law (2 q.h.)

A procedural and substantive study of legal relations among nation states.

22.542 American Foreign Policy I (2 q.h.)

Recent and current American foreign affairs. Prereq. 22.533 or equiv.

22.543 American Foreign Policy II (2 q.h.)

Recent and current American foreign affairs continued. Prereq. 22.542 or equiv.

22.544 Government and Politics in the Soviet Union I (2 q.h.)

An analysis of modern totalitarian theory and practice is followed by a study of the ideological and historical bases of the Soviet dictatorship. Prereq. 22.522 or equiv.

22.545 Government and Politics in the Soviet Union II (2 q.h.)

A continuation of 22.544. A study of the Soviet federalism, party and state organization, with special attention to the problems of political succession. Prereq. 22.544 or equiv.

22.547 Government and Politics of Communist China I (2 q.h.)

A study of Chinese political culture with emphasis on the nineteenth-century cultural, economic, and political impact of the West, the emergence of the Communist Party under the leadership of Mao, and the progressive disintegration of Kuomintang leadership. Prereq. 22.522 or equiv.

22.548 Government and Politics of Communist China II (2 q.h.)

A study of ideology, party, and state organization and behavior, and the Cultural Revolution. Prereq. 22.547 or equiv.

22.551 Current Political Issues (2 q.h.)

A topical analysis of the constitutional and political basis of selected problems in American political life.

22.552 Government and Politics in the Middle East I (2 q.h.)

A study of political change, economic growth, and social adaptation in selected countries of the Middle East. Foreign policies are also considered, especially the ties of the Middle Eastern countries with northern Africa. Prereq. 22.522 or equiv.

22.553 Government and Politics in the Middle East II (2 q.h.)

A continuation of 22.552. Prereq. 22.552 or equiv.

22.555 Government and Politics of Latin America I (2 q.h.)

After a discussion of the historical background of the Latin American nations, an analysis of the cultural, economic, social, and political characteristics of these countries is undertaken. Political violence and the breakdown of democratic governments is given particular attention. Prereq. 22.522 or equiv.

22.556 Government and Politics of Latin America II (2 q.h.)

This course analyzes politics of Mexico, Cuba, and Chile; the Communist, one-party, and democratic approaches to political development are compared, each of the three countries is used as an example. Prereq. 22.555 or equiv.

22.558 Government and Politics of South East Asia (2 q.h.)

A study of political instability and problems of establishing democratic structures and processes in the Philippines, Thailand, and India. Prereq. 22.522 or equiv.

22.559 Government and Politics of Japan (2 q.h.)

The historical development of the Japanese nation is studied with particular attention to the growth of fascism. Efforts to create a viable democracy since World War II is a major concern of the course. Prereq. 22.522 or equiv.

22.560 Politics and Policies of the Developing Nations I (2 q.h.)

Colonialism and the struggles for independence are discussed and the common problems of developing nations are analyzed. Topics include economic development, urbanization, cultural fragmentation, and revolution. Prereq. 22.522 or equiv.

22.561 Politics and Policies of the Developing Nations II (2 q.h.)

Based on the foundation provided in Part I, this course deals with efforts of developing countries to achieve rapid social, economic, and political modernization. The frequency of military takeovers and the prevalence of corrupt, inefficient government bureaucracies are discussed. The democratic and authoritarian avenues toward development are compared and evaluated. Prereq. 22.560 or equiv.

22.562 Government and Politics of Sub Saharan Africa (2 q.h.)

Comparative analysis of political culture, organization, and behavior of African states south of the Sahara. Prereq. 22.522 or equiv.

22.563 Government and Politics of Northern Africa (2 q.h.)

Comparative analysis of political culture, organization, and behavior of African states north of the Sahara. Emphasis is on Morocco, Algeria, Tunisia, and Egypt. Prereq. 22.522 or equiv.

22.564 Communism in Eastern Europe I (2 q.h.)

A study of the conditions and circumstances surrounding the establishment of Communist regimes in Eastern Europe immediately after the Second World War and their relations with the Soviet Union. Prereq. 22.522 or equiv.

22.565 Communism in Eastern Europe II (2 q.h.)

A continuation of 22.564. A study of nationalism, popular revolt, and socio-economic change in the 1950's and 1960's. Attention is given to the changing role of the Soviet Union in bloc affairs and the development of polycentrism. Prereq. 22.564 or equiv.

- 22.591 Honors Program I (4 q.h.)**
Prereq. approval of the Dean.
- 22.592 Honors Program II (4 q.h.)**
Prereq. 22.591.
- 22.593 Honors Program III (4 q.h.)**
Prereq. 22.592.

22.601 Introduction to Political Science I (4 q.h.)

Basic political concepts and forces of organization from the classical Greeks to the modern nation-state. The Soviet Union and the United Kingdom are contrasted as contemporary illustrations of the institutional distinction between a totalitarian and a constitutional system. (Not open to students who intend to receive credit for 22.501, 22.502, 22.503)

22.602 Introduction to Political Science II (4 q.h.)

The development of operational liberty in the United States and its constitutional underpinnings are considered, together with an analysis of the national American political process and the conduct of recent American foreign relations. (Not open to students who intend to receive credit for 22.501, 22.502, 22.503)

23—HISTORY

Consultant: R. H. Robinson, Chairman, Department of History, College of Liberal Arts, 358 Richards Hall, Tel. 437-2660.

Coordinator of Western Civilization and Adviser to History Majors: G. H. Herman, Department of History, College of Liberal Arts, 375 Richards Hall, Tel. 437-2660.

23.500 The Historian's Craft (4 q.h.)

The ways in which the historian studies the past with emphasis on research and writing.

23.501 Western Civilization I (2 q.h.)

The beginnings of Western Civilization with emphasis on the political, economic, and social history of ancient and medieval times to 1300.

23.502 Western Civilization II (2 q.h.)

Early Modern Europe from 1300 to 1789 with an examination of the two major intellectual movements, the Renaissance and the Enlightenment, and their impact on the rise of national states, capitalism, and Protestantism.

23.503 Western Civilization III (2 q.h.)

Modern Europe from 1789 to the present emphasizing the rise of ideology in a technological age.

23.504 American History I (2 q.h.)

America from 1763 to 1840 with emphasis on political institutions and policies of the new republic.

23.505 American History II (2 q.h.)

The United States from 1840 to 1900 with emphasis on the rise of the sectional controversy, the Civil War, and the economic development of the nation after the war.

23.506 American History III (2 q.h.)

The United States since 1900, an age of urbanized industrialism and international crisis.

23.509 Western Civilization A* (3 q.h.)

Western Civilization to 1648. Not open to students who intend to receive credit for 23.501 and/or 23.502.

23.510 Western Civilization B* (3 q.h.)

Western Civilization since 1648. Not open to students who intend to receive credit for 23.502 and/or 23.503.

23.511 American History A* (3 q.h.)

America from 1763 to 1877. Not open to students who intend to receive credit for 23.504 and/or 23.505.

23.512 American History B* (3 q.h.)

The United States since 1877. Not open to students who intend to receive credit for 23.505 and/or 23.506.

23.515 Women in American History (2 q.h., Group III)

An historical examination of the position and role of women in American history.

23.516 Women in European History (2 q.h., Group II)

An historical examination of the position and role of women in European history.

23.520 Population in History (2 q.h., Group I or II)

An application of the principles of demography to European history from Roman times to the present.

23.521 Ancient Middle East (2 q.h., Group I)

A study of ancient cultures and people in the Middle East to the rise of Islam.

23.522 Ancient Greece (2 q.h., Group I)

The origin and development of Greek civilization.

23.523 Ancient Rome (2 q.h., Group I)

Roman civilization in ancient times with emphasis on the rise of the Republic and the decline of the Empire.

23.524 Early Middle Ages (2 q.h., Group I)

Europe from the decline of the Roman Empire to 1050 with emphasis on barbarian migrations, the role of religion in medieval society, and the fashioning of political and economic institutions of feudalism and manorialism.

*The course sequence 23.509, 23.510 is identical to 23.501, 23.502 and 23.503.

The course sequence 23.511, 23.512 is identical to 23.504, 23.505 and 23.506.

The A and B sequence is accomplished in two quarters rather than three for the I, II, III sequence.

23.525 Late Middle Ages (2 q.h., Group I)

The medieval period from 1050 to 1350 with emphasis on the church-state controversy and the growth of classicism in the arts.

23.526 Early Modern Europe (2 q.h., Group I)

The political, economic, and social history of Europe from 1350 to 1648.

23.527 England, 500–1603 (2 q.h., Group I)

England to the coming of the Stuarts.

23.530 Byzantine History (2 q.h., Group I)

A political and cultural history of the Eastern Christian world from the fourth century to the sacking of Constantinople in 1453.

23.531 Islamic History (2 q.h., Group IV)

The history of the Muslim Arab world from the seventh century to the end of the Abbasid Caliphate in 1258.

23.532 Ottoman History (2 q.h., Group IV)

A study of the rise, glory, decay, and attempts at reform in the Ottoman Empire from the thirteenth century to World War I.

23.533 History of the Jews I (2 q.h., Group I)

A survey of the Jews from the end of antiquity to early modern times from a cultural and intellectual perspective.

23.534 History of the Jews II (2 q.h., Group II)

The role and position of the Jew in modern history.

23.537 European Intellectual History, 1350–1688 (2 q.h., Group I)

The major ideas of the Renaissance and Reformation.

23.538 European Intellectual History, 1688–1815 (2 q.h., Group I)

The broad spectrum of eighteenth-century thought with emphasis on scientific, religious, and political ideas.

23.539 European Intellectual History since 1815 (2 q.h., Group II)

The main currents of European thought considered in their social and political context from Romanticism to the present.

23.541 Europe, 1648–1789 (2 q.h., Group I)

Europe from the end of the Thirty Years' War to the French Revolution.

23.542 Europe, 1789–1870 (2 q.h., Group II)

Europe from the French Revolution to the Franco-Prussian War with a stress on the struggles for liberalism and nationalism.

23.543 Europe, 1870–1914 (2 q.h., Group II)

The background of World War I with an emphasis on the roles of nationalism, militarism, imperialism, and the European alliance system.

23.544 Europe, 1914–1939 (2 q.h., Group II)

Europe from World War I to World War II, emphasizing the failures of peacemakers at Versailles and the subsequent rise of aggressive autocracies in Italy and Germany.

23.545 Europe since 1939 (2 q.h., Group II)

World War II and its aftermath with an emphasis on the Cold War and attempts by European nations to unify the continent.

23.548 England, 1603–1815 (2 q.h., Group I)

England in the Stuart and Hanover age with emphasis on the victory of the parliamentary institutions over the monarchy.

23.549 England since 1815 (2 q.h., Group II)

The democratization of English life in the nineteenth and twentieth centuries with emphasis on changing imperial and international relations.

23.552 English Constitutional History to 1485 (2 q.h., Group I)

The development of the English constitution from Anglo-Saxon roots to the coming of the Tudors, with attention to local as well as central government.

23.553 English Constitutional History since 1485 (2 q.h., Group II)

The victory of Parliament over the King and the subsequent democratization of England's governmental institutions and processes.

23.554 France since 1815 (2 q.h., Group II)

France after Napoleon with attention to continuing attempts by the French people to find satisfactory political institutions.

23.555 Germany since 1815 (2 q.h., Group II)

An analysis of the role of nationalism in German life after 1815 with emphasis on unification, militarism, and imperialism.

23.556 Italy since 1815 (2 q.h., Group II)

The unification of Italy, the attempt to establish constitutional monarchy, the rise of fascism after World War I, and the movement toward democratic republicanism after World War II.

23.557 Ireland since 1800 (2 q.h., Group II)

A study of the Irish question in British politics from the Act of Union to the establishment of the Free State.

23.558 European Economy and Society to 1750 (4 q.h., Group I)

A topical survey of European economic and social development in the pre-industrial period.

23.559 European Economy and Society since 1750 (4 q.h., Group II)

A topical survey of European economic and social development from the beginnings of industrialization to the present.

23.560 American Indians (2 q.h., Group III)

A survey of the American Indian from pre-Columbian times to the present.

23.561 Colonial America to 1689 (2 q.h., Group III)

The exploration and settlement of North America with emphasis on the establishment of political, social, and economic institutions.

23.562 Colonial America, 1689–1763 (2 q.h., Group III)

North America in an age of international rivalry for the continent.

23.563 American Revolution and Constitution (2 q.h., Group III)

America's quest for independence from England and the efforts to establish governments in the new republic.

23.564 American Constitutional History, 1789–1900 (2 q.h., Group III)

Selected topics in the development of the American Constitution with primary emphasis on federalism and the relations of government and the economy.

23.565 American Constitutional History since 1900 (2 q.h., Group III)

Topics include the conflict between the liberal and conservative attitudes toward the role of government in the economy and the role of the Supreme Court in the struggle for civil liberties and rights.

23.566 United States since 1945 (4 q.h., Group III)

The American people from the close of World War II to the present.

23.567 American Diplomatic History (2 q.h., Group III)

Selected topics in the history of American foreign relations and policy since 1789.

23.568 American Social History (2 q.h., Group III)

Selected topics in the life of the American people since 1789.

23.569 American Economic History (2 q.h., Group III)

Selected topics in the development of the capitalist economy in America since 1789 with attention to the role of government.

23.571 American Urban History (2 q.h., Group III)

The development of urban society in the United States since 1800.

23.574 Afro-American History (2 q.h., Group III)

The history of Afro-Americans from colonial times to the present.

23.575 Populism and Progressivism (2 q.h., Group III)

A topical history of the United States from 1877 to 1917 concentrating on its social and cultural reactions to the processes of industrialization and urbanization.

23.576 The United States, 1917–1933 (2 q.h., Group III)

A topical history of the United States in time of world war, prosperity, and depression.

23.577 The Age of Roosevelt (2 q.h., Group III)

America in the era of the Great Depression and World War II.

23.580 Perceptions of America (2 q.h., Group III)

A study of the image of America and Americans as expressed by Americans and others.

23.581 Latin America to 1826 (2 q.h., Group IV)

The fusing of Indian, Iberian, and Negro cultures in Latin America and the quest for political independence.

23.582 Latin America, 1826–1920 (2 q.h., Group IV)

The attempts by Latin Americans to establish stable societies and democratic governments.

23.583 Contemporary Latin America (2 q.h., Group IV)

The struggles of Latin Americans for political, economic, and social development since 1920.

23.584 The Far East to 1850 (2 q.h., Group IV)

The history of China and Japan prior to their opening by the West in the mid-nineteenth century.

23.585 China since 1850 (2 q.h., Group IV)

A century of China's history with emphasis on the western impact on Chinese civilization, China's struggle to maintain independence, and the victory of communism in the twentieth century.

23.586 Japan since 1850 (2 q.h., Group IV)

An analysis of Japanese domestic developments and foreign relations since the mid-nineteenth century.

23.588 Africa to 1885 (2 q.h., Group IV)

African prehistory; the evolution of African government and society; the dynamics of Afro-European contact before 1885.

23.589 Africa since 1885 (2 q.h., Group IV)

The European impact on Africa; the rise of African nationalism; the emergence of independent African states.

23.591 Modern Middle East (2 q.h., Group IV)

The Middle East since 1914 with attention to Zionism, Pan Arabism, the effects of two world wars, and the postwar settlements.

23.592 India and Pakistan (2 q.h., Group IV)

The political and religious history of the peoples who formed India and Pakistan with an account of internal developments and foreign relations since independence.

23.593 Southeast Asia (4 q.h., Group IV)

The cultures of the peoples of Southeast Asia with an examination of the impact of European nations upon them and an account of their quests for national identity and economic development.

23.594 Russia, 1450–1801 (2 q.h., Group I)

The emergence of Russia as a recognized European power with an account of westernization and expansion in the eighteenth century.

23.595 Russia, 1801–1917 (2 q.h., Group II)

The history of the Russian people and their government from the days of Czar Alexander I to the revolutions of 1917.

23.596 Russia since 1917 (2 q.h., Group II)

The revolutions of 1917 and the subsequent history of the Russian people and their government with special emphasis on foreign relations.

23.597 Honors Program I (4 q.h.)

Prereq. approval of Dean.

23.598 Honors Program II (4 q.h.)

Prereq. 23.597.

23.599 Honors Program III (4 q.h.)

Prereq. 23.598.

23.601 Western Civilization IV (4 q.h.)

The major ideas and institutions of Western Civilization from ancient times to 1648. (Not open to students who intend to receive credit for 23.501, 23.502, or 23.509)

23.602 Western Civilization V (4 q.h.)

A continuation of 23.601, covering the period since 1648. (Not open to students who intend to receive credit for 23.502, 23.503, or 23.510)

23.699 Field Work in History (6 q.h.)

Extra-collegiate experience in historical research or historical agencies. (Refer to page 82 describing field work courses) Prereq. Survey courses in Western Civilization and American History and 23.500.

25—SOCIAL WELFARE (see page 181.)

26—PHILOSOPHY

Consultant: Prof. W. L. Fogg, Chairman, Philosophy Dept. (L.A. College)

26.501 Introduction to Philosophy I (2 q.h.)

An examination of the aims, functions, and methods of philosophy by means of a systematic study of one or two philosophers. Questions in ethics and moral philosophy stressed in the latter part of the quarter.

26.502 Introduction to Philosophy II (2 q.h.)

Development of some of the major conceptions of the meaning of human existence, the nature of human knowledge, and the nature and existence of God.

26.503 Introduction to Philosophy III (2 q.h.)

A study of some of the central views of the aims, structure, and functions of society. One other area in philosophy will be discussed in the latter half of this quarter.

26.510 Introduction to Philosophy (Intensive) (6 q.h.)

An examination of the aims, functions, and methods of philosophy in comparison with other areas of human knowledge and valuation. Inquiry into the nature of morality, kinds of moral judgments, and types of ethical theories with particular attention to their application to moral issues of our day. Comparison of major conceptions of the ultimate meaning of human existence, the nature of mind, freedom, and God. Not open to students who have taken 26.501, 26.502, 26.503, or equiv.

26.504 The Greek and Roman Philosophers (2 q.h.)

Development of western thought from the seventh century B.C. until the time of Christ with emphasis upon Plato, Aristotle, and the Stoics.

26.505 The Ages of Belief and Adventure (2 q.h.)

The leading philosophers of the early Christian, Medieval, and Renaissance periods with particular attention to St. Augustine, St. Thomas, Francis Bacon, and Thomas Hobbes. Prereq. 26.504 or equiv.

26.506 The Ages of Reason and Enlightenment (2 q.h.)

Philosophy in the seventeenth and eighteenth centuries with emphasis upon Descartes, Spinoza, Locke, Hume, and Kant. Prereq. 26.505 or equiv.

26.507 Philosophy of the Nineteenth Century (2 q.h.)

Philosophic trends in the nineteenth century considered as background for the understanding of ideas influential in the twentieth century. Prereq. 26.503, 26.506 or equiv.

26.508 Twentieth-Century Philosophy (2 q.h.)

Discussion of the major contemporary philosophic trends as represented by logical positivism, analytic philosophy, and existentialism. Prereq. 26.507 or equiv.

26.509 Major Thinkers of our Time (2 q.h.)

An in-depth study of two or three philosophers, representatives of which would be Austin, Ayer, Carnap, Dewey, Lewis, Maritain, Moore, Sartre, or Whitehead. Prereq. 26.508 or equiv.

26.511 Philosophy of Art I (2 q.h.)

The nature of art and the experience of beauty.

26.512 Philosophy of Art II (2 q.h.)

Theories concerning art and aesthetic experience such as those of Plato, Aristotle, Tolstoy, Santayana, Dewey, and Cassirer. Prereq. 26.511 or equiv.

26.513 Philosophy of Art III (2 q.h.)

A study of the problems of artistic taste, standards of criticism, and the objectivity of artistic judgments. Concludes with a discussion of the arts, the artist, and society. Prereq. 26.512 or equiv.

26.514 The Human Search for Meaning (2 q.h.)

The role of selected recent philosophy and literature in the human struggle for meaning and identity. Some of the themes to be explored: freedom and responsibility; alienation and anxiety; death and finitude.

26.515 Images of Man in Philosophy (2 q.h.)

An exploration of selected concepts of the nature of man in philosophy and literature.

26.516 Technology and Man (2 q.h.)

An exploration of the human issues which have arisen in a technological age. Issues such as the relations between man and machine and the moral issues surrounding organ transplants are representative.

26.517 Utopias and Anti-Utopias (2 q.h.)

A study of utopian and anti-utopian literature as expressions of social criticism and as theories of social reform.

26.521 Philosophy of Religion I (2 q.h.)

A study of the nature of religious experience and beliefs about the nature of God.

26.522 Philosophy of Religion II (2 q.h.)

The origins, nature, and functions of religion. Prereq. 26.521 or equiv.

26.523 Philosophy of Religion III (2 q.h.)

Intensive study of some of the major problems such as natural and moral evil, the soul, immortality, miracles, and religious knowledge. Prereq. 26.522 or equiv.

26.524 The Great Eastern Religions I (2 q.h.)

The development of eastern primitive religions and their subsequent evolution into the sophisticated forms of the contemporary eastern religions.

26.525 The Great Eastern Religions II (2 q.h.)

Study of Egyptian and Babylonian religions, Confucianism, and Taoism. Prereq. 26.524 or equiv.

26.526 The Great Eastern Religions III (2 q.h.)

Study of Hinduism, Buddhism, and Shintoism. Prereq. 26.525 or equiv.

26.527 The Great Western Religions I (2 q.h.)

The development of western primitive religions and their subsequent evolution into the sophisticated forms of the contemporary western religions.

26.528 The Great Western Religions II (2 q.h.)

Study of Zoroastrianism, Judaism, and Christianity. Prereq. 26.527 or equiv.

26.529 The Great Western Religions III (2 q.h.)

Study of the religion of Islam, contemporary religious sects, and religious phenomena. Prereq. 26.528 or equiv.

26.531 Ethics I (2 q.h.)

Introduction to moral problems such as egoism and altruism, good and evil, conscience, obligation, and human freedom.

26.532 Ethics II (2 q.h.)

Critical discussion of some of the major ethical theories and the implications of modern psychological and sociological theories about man and society. Prereq. 26.531 or equiv.

26.533 Ethics III (2 q.h.)

The relations of ethical theory and morality to religion, social philosophy, art, and science. Prereq. 26.532 or equiv.

26.534 Logic (2 q.h.)

Emphasis upon logic as a practical discipline which enables the student to analyze types of arguments and to detect fallacies in arguments.

26.535 Ethics (intensive) (6 q.h.)

Same as 26.532, 533, and 534.

26.541 Social Philosophy I (2 q.h.)

Critical examination of the leading socio-political ideologies in regard to their conceptions of the character, structure and function of society. Plato and Aristotle emphasized.

26.542 Social Philosophy II (2 q.h.)

Continuation of 26.541 with emphasis upon Hobbes, Locke, Hegel, and Mill. Prereq. 26.541 or equiv.

26.543 Social Philosophy III (2 q.h.)

Emphasis upon Marxism, contemporary communism, fascism, capitalism, and contemporary social ideologies. Prereq. 26.542 or equiv.

26.544 Selected Topics in Philosophy I (2 q.h.)

Advanced course. Readings chosen jointly by students and instructor. Has included such topics as aggression, utopian literature, Marxism, pragmatism.

26.545 Selected Topics in Philosophy II (2 q.h.)

Continuation of 26.544

26.546 Selected Topics in Philosophy III (2 q.h.)

Continuation of 26.545

26.551 The Existentialist Revolt (2 q.h.)

Sources of existentialism in the Western tradition with emphasis upon Kierkegaard and Nietzsche.

26.552 The Existentialist Challenge (2 q.h.)

The existential view of man and his world with emphasis upon Heidegger, Sartre, and the religious existentialists—Marcel, Tillich, and Buber. Prereq. 26.551 or equiv.

26.553 Existentialism Appraised (2 q.h.)

Contemporary assessments of the existentialism movement, its meaning, significance, and truth. Prereq. 26.552 or equiv.

26.560 Buddhism (2 q.h.)

The principal teachings of the Buddhists.

26.561 Hinduism (2 q.h.)

The major Hindu teachings.

26.562 Islam (2 q.h.)

The major principles of Islam.

26.563 Judaism (2 q.h.)

The elements of Judaism.

26.567 Mysticism: East & West (2 q.h.)

An exploration of mystical experiences through a discussion of some representative religious mystics.

26.570 Religion & Myth (2 q.h.)

A study of myths as the expressions of religious man's experience of the world and himself. Examples will be drawn from primitive religions and the traditional religions of East and West.

27—FINE ARTS

Consultant: Prof. R. L. Wells, Chairman, Art Dept. (L.A. College)

27.501 Introduction to the Arts (2 q.h.)

Introduction to the techniques and meanings of various artistic expressions in painting, sculpture, drawing, architecture, and graphic arts.

27.504 History of Art I (2 q.h.)

History of Western art from prehistoric times to the end of the Roman Empire.

27.505 History of Art II (2 q.h.)

History of Western art from the end of the Roman Empire to the late sixteenth century. Prereq. 27.504.

27.506 History of Art III (2 q.h.)

History of Western Art from the late sixteenth century to the twentieth century. Prereq. 27.505.

27.507 Ancient Architecture (2 q.h.)

Developments in the builder's art from prehistoric times to the end of the Classical Era.

27.508 Medieval and Renaissance Architecture (2 q.h.)

A study of architecture from the Early Christian Period through the Renaissance.

27.509 European Architecture (2 q.h.)

Seventeenth- eighteenth- and nineteenth-century architecture.

27.510 Ancient Painting and Sculpture I (2 q.h.)

A survey of art from pre-historic period through Egypt and Mesopotamia.

27.511 Ancient Painting and Sculpture II (2 q.h.)

A survey of art from Crete through Greece and Rome.

27.512 Medieval Painting and Sculpture (2 q.h.)

Early Christian era; Byzantine, Romanesque, and Gothic art.

27.514 European Painting (2 q.h.)

Development of painting from the late sixteenth century to the middle of the nineteenth century in Northern and Western Europe.

27.515 Modern Painting I (2 q.h.)

The development of painting from late nineteenth century to the Surrealist movement.

27.516 Modern Painting II (2 q.h.)

The various styles of painting from Surrealism to contemporary art.

27.518 Twentieth-Century American Architecture (2 q.h.)

Study of architecture from Richardson to the present.

27.519 Twentieth-Century European Architecture (2 q.h.)

Study of architecture from Le Corbusier to the present.

27.520 Italian Renaissance Art (2 q.h.)

Study of painting and sculpture of the fifteenth and sixteenth centuries.

27.522 French Painting (2 q.h.)

Study of French painting of the nineteenth century.

27.523 English Art (2 q.h.)

English art from the Gothic to the nineteenth century.

27.524 American Art I (2 q.h.)

The development of American architecture, sculpture, and painting from Colonial times to the War of Independence.

27.525 American Art II (2 q.h.)

The development of American architecture, sculpture and painting from the Revolution to the Civil War. Prereq. 27.524 or equiv.

27.526 American Art III (2 q.h.)

The development of American architecture, sculpture and painting from the Civil War to the present. Prereq. 27.525 or equiv.

27.527 Life Drawing I (3 q.h.)

Basic life drawing involving anatomy and study of figure drawing. Prereq. 27.543 or other drawing courses on departmental approval.

27.528 Life Drawing II (3 q.h.)

Life drawing of the figure in various media. Prereq. 27.527.

27.529 Life Drawing III (3 q.h.)

Figure drawing and figure composition in various media. Prereq. 27.528.

27.535 African Art (2 q.h.)

Various stylistic characteristics of sculpture and other artistic expressions of the major cultures of Africa from the thirteenth to the twentieth century.

27.536 Latin American Art (2 q.h.)

Pre-Columbian and post-Columbian art forms of Latin America, including architecture, sculpture, painting, and the decorative arts—excluding Mexico.

27.538 Chinese Painting (2 q.h.)

A history of the Chinese art of painting from its inception to the twentieth century.

27.539 Japanese Art (2 q.h.)

The arts of painting, sculpture, and architecture in Japan.

27.540 Free-hand Drawing (3 q.h.)

An elementary course in drawing. (Does not fulfill the drawing requirement for the studio art major.)

27.541 Drawing I (3 q.h.)

Practice in the techniques and development of drawing in pencil, pen, and ink, with concentration on basic drawing problems.

27.542 Drawing II (3 q.h.)

Practice in the techniques of wash drawing, scratch board drawing, and mixed medias. Prereq. 27.541 or equiv.

27.543 Drawing III (3 q.h.)

Study of human anatomy and the practice of figure drawing and composition. Prereq. 27.542 or equiv.

27.544 Graphic Arts I (3 q.h.)

Creative expression in various graphic art media such as woodcuts.

27.545 Graphic Arts II (3 q.h.)

Execution of prints in various media and the printing process.

27.546 Graphic Arts III (3 q.h.)

Execution of more advanced print making with various graphic media.

27.547 European Graphic Arts (2 q.h.)

History of graphic arts from the Medieval period to the end of the nineteenth century. Development of engraving, etching, woodcuts, and lithography.

27.551 Painting—Basic Level I (3 q.h.)

Practice and creative expression in the technical fundamentals of figure and landscape painting.

27.552 Painting—Basic Level II (3 q.h.)

Creative expression in advance painting problems of figure study. Prereq. 27.551 or equiv.

27.553 Painting—Basic Level III (3 q.h.)

Creative expression in advanced painting problems in composition. Prereq. 27.552 or equiv.

27.554 Painting—Advanced Level I (3 q.h.)

Painting with concentration upon the development of personal expression and style.

27.555 Painting—Advanced Level II (3 q.h.)

Painting with concentration upon the development of personal style and the execution of various painting problems.

27.556 Painting—Advanced Level III (3 q.h.)

Development of style and experimentation with various media.

27.557 Advanced Graphic Arts I (3 q.h.)

Execution of advanced printmaking in various media. Prereq. 27.544, 546, 547 or other graphic courses on departmental approval.

27.558 Advanced Graphic Arts II (3 q.h.)

Printmaking in various experimental media. Prereq. 27.557.

27.559 Advanced Graphic Arts III (3 q.h.)

Printmaking in various media. Prereq. 27.558.

27.560 Oriental Indian Art (2 q.h.)

The national Indian styles of sculpture, painting, and architecture

27.561 Basic Color and Design I (3 q.h.)

Study and practice of the principles of design and science of color.

27.562 Basic Color and Design II (3 q.h.)

Advanced study in the science of color. Prereq. 27.561 or equiv.

27.563 Basic Color and Design III (3 q.h.)

Advanced problems in design. Prereq. 27.562 or equiv.

27.564 Advanced Color and Design (3 q.h.)

Creative expression in various color and design problems.

27.571 Basic Commercial Design I (3 q.h.)

Study and creative work in layout, illustration, advertising, and typography.

27.572 Basic Commercial Design II (3 q.h.)

Advanced commercial design problems. Prereq. 27.571 or equiv.

27.573 Basic Commercial Design III (3 q.h.)

Advanced commercial design problems. Prereq. 27.572 or equiv.

27.574 Advanced Commercial Design (3 q.h.)

Creative problems in illustration design.

27.587 History of Photography I (2 q.h.)

Early developments in photography from ancient times to the daguerreotype.

27.588 History of Photography II (2 q.h.)

Developments of modern photography from the work of Stieglitz to the present.

Prereq. 27.587 or equiv.

27.589 History of Photography III (2 q.h.)

Study of styles in contemporary photography with emphasis on major modern photographs. Prereq. 27.588 or equiv.

27.591 Art Seminar (2 q.h.)

Specific techniques, problems, and theories in art. Students will be responsible for research projects and papers.

27.592 New York Art Seminar (2 q.h.)

Study and inspection of the painting collections in the Metropolitan Museum of Art, Frick Collection, Museum of Modern Art, and the Guggenheim Museum.

27.594 European Art Seminar (2 q.h.)

A four-week study and travel seminar through major European art centers, with emphasis on the major works of art in each.

27.597 History and Technique of Film Art I (2 q.h.)

A study of the development of film art in Europe and America from its origins to 1945.

27.598 History and Technique of Film Art II (2 q.h.)

A study of the development of film art in the United States and Europe from 1945 to the present. Prereq. 27.597.

27.599 History and Techniques of Film Art III (2 q.h.)

Study of films by major contemporary directors. Prereq. 27.598.

27.600 Honors Program I (4 q.h.) Prereq. approval of the Dean.

27.601 Honors Program II (4 q.h.) Prereq. 27.600.

27.602 Honors Program III (4 q.h.) Prereq. 27.601.

27.603 Mexican Art (2 q.h.)

Pre-Columbian art from the Archaic and Classical periods to the present.

28—MUSIC

Consultant: Prof. R. L. Nadeau, Chairman, Music Dept. (L.A. College)

28.501 Introduction to Music (2 q.h.)

The principal concern is to teach the student a technique for listening actively to music. The course surveys and analyzes works by J. S. Bach, Mozart, Beethoven, Wagner, Stravinsky, and others.

28.503 Women in Music (2 q.h.)

A study in depth of the historical role of women in music; woman as composer, performer, patron, inspiration.

28.507 Fundamentals of Music I (for non-majors) (2 q.h.)

A course for beginners who are not music majors. The development of music reading and hearing skills. Simple notation of pitch and rhythm. Scales, intervals, chords.

28.508 Fundamentals of Music II (2 q.h.)

Continuation of course 28.507. New students admitted upon examination. Dictation, part-singing, and sight-singing. Beginning instrumental studies in recorder. Prereq. 28.507 or equiv.

28.509 Fundamentals of Music III (2 q.h.)

Continuation of course 28.508. New students admitted upon examination. Major, minor, and modal melodies. Seventh-chord symbols. Voice leading, cadences. Chorale analysis. Continuation of instrumental studies on recorder. Prereq. 28.508 or equiv.

28.510 Music and Art (2 q.h.)

A chronological survey of the relationship between music and art comparing the musical styles of great composers and the pictorial qualities of the master painters of our heritage.

28.511 History of Music (2 q.h.)

A survey of the historical trends in music from ancient times to the present. Men, ideas, and events which have influenced change in musical style will be highlighted. From this course, the student should gain a broad overview of musical literature and history which will enhance his understanding and future concert-going.

28.515 Contemporary Music (2 q.h.)

Contemporary music and its techniques seen as a mirror of our time. Major composers studied include Stravinsky, Debussy, Ravel, Bartok, Prokofiev, Hindemith, Milhaud, and Schoenberg.

28.517 Music as a Means of Social Expression (2 q.h.) (formerly Music as the Expression of Man)

A general and philosophical view of music in Western culture covering the following: aspects of social relevance; compositional style in various periods; and important themes, (war and peace, love and rejection, etc.) examined in a musical context. When pertinent, related concepts from the fine arts and from philosophy will be explored. Live performance, recordings, and audio-visual media will be used.

28.520 Musical Forms (2 q.h.)

The fugue, the sonata, theme and variations, rondo, the lied; analysis of the symphony, the string quartet, the opera, and the tone poem.

28.521 The Symphony (2 q.h.)

A thorough study of the symphonies of Haydn, Mozart, Beethoven, Berlioz, Brahms, Dvorak, and Tchaikovsky.

28.522 The Concerto (2 q.h.)

The evolution of the concerto from its origins in the Baroque period to its use in our time. Concertos for every instrument are studied, including piano, cello, violin, horn, organ, and bassoon.

28.523 Great Literature for the Piano (2 q.h.)

The study of pianoforte music written in the nineteenth and early twentieth centuries by masters such as Beethoven, Chopin, Schumann, Liszt, Debussy, and Ravel.

28.524 The World of Opera (2 q.h.)

Distinctions will be made between music drama and the number opera. Students will be required to acquire librettos. Aria, recitative, ensemble, and other basic elements of opera will be isolated and discussed.

28.526 Jazz: Evolution and Essence (2 q.h.)

The many roots of jazz and its development from the worksong and the vocal blues to the avant-garde experiments of today. Contributions of the major performers: soloists, arrangers, composers. The problems of "on-the-spot" creativity and personal expression. The "beat." Multiplicity of accent.

28.528 Ear Training I (2 q.h.)

Rhythmic articulation. Solmization studies in major keys; G and F Clef. Conductor's beat patterns in simple meter. Rhythmic and melodic dictation in major keys. Interval studies.

28.529 Ear Training II (2 q.h.)

Continuation of course 28.528. Solmization studies in major keys with chromatics, and in minor keys: G, F, and C clef. Conductor's beat patterns in simple and compound meter. Melodic dictation in major and minor keys. Harmonic dictation, interval studies. Prereq. 28.528 or equiv.

28.530 Ear Training III (2 q.h.)

Continuation of course 28.529. Advanced rhythmic, melodic, and harmonic dictation. Sight singing of one- and two-part melodies in major and minor keys, with chromatics. Modulation. Singing in 4 parts. Advanced interval studies. Prereq. 28.529 or equiv.

28.531 Life and Works of J. S. Bach (2 q.h.)

A comprehensive survey of the music and background of J. S. Bach with four areas of concentration: Bach and the figured bass; the young Bach (Baroque Romanticism); Bach, the churchman; Bach, the secular composer.

28.532 Life and Works of Mozart (2 q.h.)

Mozart's mastery in all fields of music with particular emphasis on his development of the symphony and his achievements in opera. The man, as seen through his letters, as performer and composer.

28.533 Life and Works of Beethoven (2 q.h.)

An analysis of the complex personality and art of this supreme musical genius. His relation to the turbulent times in which he lived; his role as the great transition figure in the passage from classicism to romanticism. His psychological and aesthetic growth will be observed by studying similar forms written in different periods of his life.

28.534 Pedagogy of Music I (2 q.h.)

Introduction to philosophy principles and procedures in the teaching of music.

28.535 Pedagogy of Music II (2 q.h.)

Procedures, program planning and techniques in teaching vocal and instrumental music. Prereq. 28.534 or consent of instructor prior to registration.

28.536 Pedagogy of Music III (2 q.h.)

Methods, procedures and materials of/for advanced vocal and instrumental music instruction. Prereq. 28.534, 28.535 or consent of instructor prior to registration.

28.540 The Black Artist in Music (2 q.h.)

General survey of Afro-American music in the U.S. traced from its origins in Africa to the present. Emphasis on jazz, its history, and an analysis of the contributions of major innovative figures. Sources and origins of jazz, as well as their contemporary extensions will be studied. Intended to introduce the student to the vast and rich expanses of black musical culture, both from a musical and a socio-historical standpoint.

28.541 Nationalism in Music (2 q.h.)

The relationship of folk song, dance, and art to symphonic literature; nationalistic elements in the music of Dvorak, Tchaikovsky, Grieg, Copland, Shostakovich, Sibelius; the effect of ideology on composers; the Soviet composers.

28.542 Music of the U.S.A. (2 q.h.)

American music from the colonial times to the present, influence of Stravinsky and Schoenberg on American composers, music for the theater, jazz, electronic music, and contemporary musical trends.

28.543 Great Choral Literature (2 q.h.)

A study of sacred and secular choral literature from medieval to contemporary times.

28.544 Chamber Music (2 q.h.)

Ensemble music for small groups. Examples for analysis are selected from the Baroque Period to contemporary styles.

28.545 Wagner's Ring Cycle (2 q.h.)

An in-depth study of Wagner's Cycle of music drama: Das Rheingold, Walkure, Siegfried Gotterdammerung, Wagner's compositional techniques (e.g., the use of leitmotif and musical metaphor) is examined in detail.

28.546 Life and Work of Stravinsky (2 q.h.)

Le Sacre, Petrouchka, Symphony of Psalms, and more recent works are given detailed attention. His contributions to twentieth-century style: neo-classicism, pandiatonicism, and additive style are analyzed and his strong influence on other composers is noted.

28.547 The Music of Bruckner and Mahler (2 q.h.)

A study of their major works and aesthetic principles. Large scale symphonic and vocal works will be examined as a culmination of nineteenth-century Romanticism and as the forerunners of twentieth-century Expressionism.

28.548 Great Love Songs Through the Ages (2 q.h.)

The music of love songs, ballads, chansons, lieder and opera arias from the Middle Ages to today, will be studied, listened to, and discussed.

28.549 A History of Musical Instruments in Western Culture (2 q.h.)

A study of the evolution of musical instruments from the Middle Ages to today. General principles of instrument construction and the historical contexts of their use through the ages will be discussed. The evolution of changing tastes in instrumental sound will be illustrated through listening to recordings and, whenever possible, through live performance. Field trips to the Boston Museum of Fine Arts (which houses an excellent early instrument collection) and to various instrument builders in the Boston area will help to give the student a first-hand view of some ancient and modern instruments.

28.550 Life and Works of Haydn (2 q.h.)

A study of his major works and aesthetic principles. Emphasis on Haydn's contributions to Symphonic form; his oratorios, masses, chamber music, songs, symphonies, and works for the keyboard.

28.551 Life and Works of Brahms (2 q.h.)

The Romantic-Classical; his technique of germinal motivic construction; a study of his symphonies, concertos, chamber music, the songs, and the Requiem.

28.552 Life and Works of Chopin (2 q.h.)

A comprehensive study of the pianoforte compositions of Chopin including the sonatas, concertos, and the shorter forms such as the waltzes, nocturnes, preludes, mazurkas, etudes, scherzos, polonaises, impromptus, and ballades.

28.553 Melodrama and the Macabre: Aspects of Romanticism in Music (2 q.h.)
The focus of this course is on program music of the Romantic period dealing with strange and macabre subjects. Works studied will include Schubert's Erlkonig, Weber's Der Freischutz, and Berlioz' Symphonie Fantastique. Investigations will be made into the forces which produced this aspect of Romanticism with references to literature and art and how they affected the musical scene.

28.555 Contemporary Opera (2 q.h.)

Almost every major composer including Schoenberg, Berg, Bartok, Stravinsky, Hindemith, and Poulenc have contributed to the opera repertory, thus illustrating twentieth-century style. Among the works studied are: Wozzeck, the Rake's Progress, Dialogue of the Carmelites, and Bluebeard's Castle.

28.571 Piano Class I (2 q.h.)

Fundamentals of music and interval identification. Scales and arpeggios, hands separate. Ear training through keyboard harmony and some emphasis on ensemble playing. Repertoire requirements; early Mozart minuets, etc.

28.572 Piano Class II (2 q.h.)

Scales and arpeggios, hands together. Primary triads in some major and minor keys for improvisation and ear playing. Sight playing and some duet performances. Repertoire: Anna Magdalena. Notebook by J. S. Bach. Prereq. 28.571 or equiv., or consent of instructor prior to registration.

28.573 Piano Class III (2 q.h.)

Scales and arpeggios, hands together (2 octaves). Primary triads in all keys adding secondary triads in some keys. Transposition of simple tunes, including The National Anthem, using own accompaniment in all keys. Sight playing, Diller—Quaille Book II, Repertoire: Complete Oxford Piano Course. Prereq. 28.572 or equiv., or consent of instructor prior to registration.

28.590 Directed Study (2 q.h.)

Independent work under the direction of the department upon a chosen topic. Limited to qualified students with approval of department chairman. Prereq. Dept. approval.

28.591 Off-Broadway Musical Seminar (2 q.h.)

A survey of the music and forms of musicals other than the traditional Broadway show. New York, off-Broadway, and community theater will be studied. Specific off-Broadway musicals will be analyzed in depth.

28.595 Opera Seminar (2 q.h.)

An historical survey of opera. Students will attend performances of several operas and write critical reviews.

28.597 Symphony Seminar (2 q.h.)

An historical survey and analytic study of the symphony orchestra. Students will attend performances of several different symphony orchestras and write critical reviews.

28.598 Musical Comedy Seminar (2 q.h.)

An historical survey and analytic study of musical shows. Students will attend performances and write critical reviews.

28.599 Theory I—Tonal Techniques A (2 q.h.)

Fundamentals. Pitch and rhythmic notation, scales, intervals, chord construction. Basic ear training; melodic and rhythmic dictation.

28.600 Theory II—Tonal Techniques B (2 q.h.)

Chord progression. Realization of figured bass, voice leading, harmonic rhythm. Non-harmonic tones. Melodic and rhythmic dictation. Prereq. 28.599 or equiv. or consent of instructor prior to registration.

28.601 Theory III—Eighteenth-Century Harmonic Practice (2 q.h.)

Choral analysis. Seventh chords, secondary dominants, modulation. Melodic and rhythmic dictation. Prereq. 28.600 or equiv. or consent of instructor prior to registration.

28.602 Music History I-Musical Literature to 1750 (2 q.h.)

A study of sacred and secular musical literature from the early Middle Ages through the Baroque. Listening to and discussion of monophony, organum, music of the troubadours and trouveres; motets, masses, and secular music by Machaut, Dufay, Josquin, Palestrina, Byrd; Elizabethan music, both vocal and instrumental; early Italian opera; music of the German protestants culminating in the works of Bach and Handel will give the student an evolutionary view of music history and style during this period.

28.603 Music History II-Music of the Classical Period (2 q.h.)

A study of changing musical styles from Stamitz, and the Mannheim School through the works of Haydn, Mozart, and early Beethoven.

28.604 Music History III-Music of the Romantic Era (2 q.h.)

Musical styles of the nineteenth century. The role of music and the musician in the changing social, economic, political and cultural structure of Europe. Music by Beethoven, Schubert, Berlioz, Brahms, Verdi and Wagner will be heard discussed and analyzed.

28.605 Theory IV (2 q.h.)

Non-dominant seventh, ninth, eleventh, and thirteenth chords. Linear embellishment of harmony and harmonization of melody. Keyboard harmony. Melodic and rhythmic dictation; part singing. Prereq. 28.601 or equiv. or consent of instructor prior to registration.

28.606 Theory V (2 q.h.)

Analysis of appropriate period forms and compositions. Chromatic and other non-diatonic harmony. Advanced modulation. Keyboard harmony. Melodic-rhythmic dictation and part singing. Prereq. 28.605 or equiv. or consent of instructor prior to registration.

28.607 Theory VI (2 q.h.)

Continuing analysis of compositions and period forms. Modern chord symbols. Basic principles of serial writing. Keyboard harmony. Melodic-rhythmic dictation and part singing. Prereq. 28.606 or equiv. or consent of instructor prior to registration.

28.608 Contrapuntal Technique I (2 q.h.)

A study of sixteenth-century counterpoint. Prereq. 28.599 or equiv.

28.609 Contrapuntal Techniques II (2 q.h.)

A study of seventeenth- and eighteenth-century counterpoint. Prereq. 28.608 or equiv. or consent of instructor prior to registration.

28.611 Musical Performance I (1 q.h.)

Participation in rehearsals and public performances and/or research, composition, arranging, conducting, solo and ensemble activity, etc., with the NU Symphony Orchestra, the Early Music Players, the NU Chorus, the NU Bands, or other ensembles under the supervision and coaching of a faculty member of the Department of Music. The student's progress will be evaluated at the end of the quarter by audition or otherwise. Prereq. audition or permission of instructor.

28.612 Musical Performance II (1 q.h.)

Prereq. audition or permission of instructor.

28.613 Musical Performance III (1 q.h.)

Prereq. audition or permission of instructor.

28.614 Musical Performance IV (1 q.h.)

Prereq. audition or permission of instructor.

28.695 Honors Program I (4 q.h.)

Prereq. permission of Dean.

28.696 Honors Program II (4 q.h.)

Prereq. 28.695.

28.697 Honors Program III (4 q.h.)

Prereq. 28.696.

29—SPEECH AND THEATRE ARTS

Consultant: Prof. E. J. Blackman, Chairman, Drama and Speech Dept. (L.A. College)

29.501 Effective Speaking I (2 q.h.)

Selection and organization of speech materials, essentials of good platform delivery, individual and class criticism of both prepared and impromptu speeches. A practical course devoted to developing an ability to speak easily, naturally, and forcefully.

29.502 Effective Speaking II (2 q.h.)

This course builds upon the techniques and principles developed in Effective Speaking I by stressing increased student proficiency. Speech organization and delivery of more complex materials with which the student is likely to be confronted in business, industry, or the professions will be studied. Prereq. 29.501.

29.503 Effective Speaking III (2 q.h.)

The individual speaker as part of a group. The role of discussion in problem analysis, problem solving, and policy making. The principles and methods of organizing and participating in group discussions. Parliamentary procedure. Prereq. 29.502.

29.504 Voice and Articulation I (2 q.h.)

A practical course aimed at developing the speaking voice; special emphasis on articulation, pitch control, vocal variety, and flexibility; basic theory of the vocal mechanism.

29.505 Voice and Articulation II (2 q.h.)

Study of the science of speech sounds, investigation of regionalisms, individual voice development. Prereq. 29.504.

29.506 Oral Interpretation (2 q.h.)

Application of basic vocal techniques to the dramatic interpretation of various forms of literature.

29.507 Business and Professional Speaking (2 q.h.)

Practice in the organization and presentation of material to fit varying audiences. Emphasis on techniques of delivery and effective presentation of ideas.

29.508 Argumentation and Discussion (2 q.h.)

Designed to acquaint the student with the basic concepts of argumentation (evidence, research, refutation). Emphasis is placed on the psychology of an audience and various types of group discussion.

29.509 Parliamentary Procedure (2 q.h.)

Methods of conducting and organizing meetings. Development of effective leadership techniques. Experience in chairing a meeting and applying rules of order.

29.511 Introduction to Theatre Arts (2 q.h.)

A course aimed at developing in theatregoers an appreciation of the total theatre experience, by studying the roles played by the artists and craftsmen of the theatre in bringing the playwright's script to life. The role of the director, actors, and designers. The role of the audience as critics.

29.521 Introduction to Dramatic Literature (2 q.h.)

The relationship between drama as literature and as theatre. Types of drama: comedy, tragedy, melodrama, farce, and drawing-room comedy. The dramatist's attitude and his style: Classicism, Romanticism, Realism, Naturalism, and Theatricalism.

29.522 Masters of the Theatre I (2 q.h.)

The plays in relationship to their times, the theatres in which they were performed, and the dramatic theory of the age. An examination of selected plays from the Classical Greek and Roman, Medieval religious and secular, and Elizabethan theatre.

29.523 Masters of the Theatre II (2 q.h.)

The art of the Italian commedia dell'arte, the Neoclassic theatre of Racine, Moliere, and Dryden, the Restoration theatre, and the plays of Goldsmith and Sheridan.

29.524 Modern European Drama (2 q.h.)

An examination of European drama of the late nineteenth century and of the twentieth century reflecting the changing views toward the nature of man and the techniques of theatre.

29.525 Modern British Drama (2 q.h.)

The drama of England and Ireland of the twentieth century reflecting the impact of modern life upon modern theatre.

29.526 Modern American Drama (2 q.h.)

A view of American drama from 1900 to the present time. The American play-write reflecting the social, philosophical, and psychological temper.

29.531 Contemporary Film (2 q.h.)

A survey of world film from the days of Edison's experiments to the present. Evaluation and critical review of representative films. Viewing of outstanding films.

29.535 Workshop in Play Production I (2 q.h.)

Training for the beginning director of plays. The organization of the producing unit. Play selection. Casting. Script analysis. Production style. Creating the floor plan. Directing simple scenes in the proscenium theatre.

29.536 Workshop in Play Production II (2 q.h.)

Studying of composition and picturization. Rehearsal techniques. Directing of simple scenes. Prereq. 29.535.

29.537 Workshop in Play Production III (2 q.h.)

Directing in the arena theatre, as well as in proscenium theatre. Prereq. 29.536.

29.541 Workshop for the Actor I (2 q.h.)

Physical preparation. Basic stage movement and deportment; the control of the stage voice; the analysis and establishment of characterization through observation and awareness of the body; improvisations and short scenes.

29.542 Workshop for the Actor II (2 q.h.)

Psychological preparation. The analysis and establishment of characterization through memory, emotion, imagination, and recall. Analysis of specific roles, the creation of a character analysis book, improvisations and short scenes.

29.543 Workshop for the Actor III (2 q.h.)

Preparing and performing the role. The physical and psychological preparation of specific roles. Short classroom scenes; the presentation of a one-act play.

29.561 Announcing I (2 q.h.)

A course dealing with the delivery of all types of radio commercials.

29.562 Announcing II (2 q.h.)

A course dealing with the delivery of prepared as well as ad lib materials so that the announcer may strengthen his spontaneous broadcast speech abilities. Prereq. 29.561.

29.563 Announcing III (2 q.h.)

A course dealing with a variety of ad lib program types in both radio and television to aid the announcer in developing his ability to think quickly and speak fluidly and dynamically. Prereq. 29.562.

29.595 Charles Playhouse Seminar (2 q.h.)

A seminar designed to teach students how to appreciate the experience of theatre-going through pre-show preparation and post-show critique, under the guidance of a faculty member as well as Charles Theatre artistic personnel.

29.596 New York Theatre Seminar (2 q.h.)

A seminar aimed at introducing the theatre arts to students by varied theatre going experiences as well as formal class discussions and studying the role of the New York stage in shaping contemporary American theatre.

29.597 London Theatre Seminar (2 q.h.)

Examination of the contemporary London theatre scene by viewing and evaluating representative productions.

29.598 Stratford Shakespeare Seminar (2 q.h.)

Seminar designed to give students an opportunity to attend four performances at the Stratford Festival Theatre; to meet with Festival actors, directors, designers; to tour the theatre plant; and to evaluate contemporary Shakespearian productions.

29.599 Creative Dramatics

Theories and methods of relating the creative techniques of pantomime, improvisations, dramatization, to work with children's programs in schools, churches, recreation facilities.

29.600 Children's Theatre

Analysis and creation of dramatic literature for children; the developing of a production for children.

30—ENGLISH

Consultant: Prof. P. C. Wermuth, Chairman, English Dept. (L.A. College)

Assoc. Consultants: Dean H. Vetstein (L.A. College)

Prof. M. Lesser (L.A. College)

Each student enrolled in Composition and Rhetoric (30.601 and 30.603) will take a Placement Examination during class. Some students may be requested to register for Elements of Composition (30.600) a 2 q.h. course designed to upgrade the student's background.

Courses required for Liberal Arts Majors are:

30.601, 30.602 Composition and Rhetoric I & II (or 30.603 Intensive)
and

30.604, 30.605 Introduction to Literary Forms I & II (or 30.606 Intensive)
For other majors, refer to English requirement listed under major.

During the changeover of English requirements, the following will apply:

Students who have successively completed:

30.504 may register for 30.602

30.505 may register for 30.604

30.507 may register for 30.605

30.501 English for International Students I (2 cl., non-credit)

Introduction to English grammar for foreign-speaking students with an emphasis on listening, speaking, and writing; selected readings and exercises to strengthen vocabulary and pronunciation.

30.502 English for International Students II (2 cl., non-credit)

A continuation of 30.501 emphasizing the preparation of written and oral reports, and business and social correspondence.

30.503 English for International Students III (2 cl., non-credit)

Advanced work in written and spoken English preparatory to entering 30.601, Composition and Rhetoric I.

30.511 Business Writing and Reports I (2 q.h.)

Developing an appropriate vocabulary and a business letter-writing philosophy.

30.512 Business Writing and Reports II (2 q.h.)

Planning, writing, and analyzing effective business letters. Prereq. 30.511 or equiv.

30.513 Business Writing and Reports III (2 q.h.)

Researching, organizing, documenting, and writing semi-technical and business reports. Prereq. 30.512 or equiv.

30.514 Technical Writing I (2 q.h.)

Introduction to types of technical documentation, memoranda, and technical reports. Writing of reports. Prereq. 30.506 or equiv.

30.515 Technical Writing II (2 q.h.)

Proposals, technical manuals and graphic aids for printed documents and presentations. Prereq. 30.514 or equiv.

30.516 Technical Writing III (2 q.h.)

Technical writing, editing, and documentation, including information retrieval, programmed instruction, and reproduction processes. Prereq. 30.515 or equiv.

30.517 Intermediate Writing (2 q.h.)

Practice in expository and imaginative writing in a variety of forms, designed to help the student discover his own style. Individual attention to the student's work. Prereq. 30.506, 30.602 or equiv.

30.518 Creative Writing I (2 q.h.)

A workshop in writing short fiction. Prereq. 30.517 or equiv.

30.519 Creative Writing II (2 q.h.)

A workshop in analyzing and editing the participants' short fiction. Prereq. 30.518 or equiv.

30.522 Introduction to Semantics I (2 q.h.)

The effect of language habits on thinking processes and on social relationships. Prereq. 30.506, 30.509, or equiv.

30.523 Introduction to Semantics II (2 q.h.)

A formulaic examination of language. Prereq. 30.522 or equiv.

30.525 The English Language I (2 q.h.)

An introduction to the scientific study of the backgrounds and historical development of the English language. Prereq. 30.506, 30.509 or equiv.

30.526 The English Language II (2 q.h.)

An examination of sounds, grammar, and usage. Prereq. 30.525 or equiv.

30.527 The English Language III (2 q.h.)

The problem of meaning and the symbolic nature of language. Prereq. 30.526 or equiv.

30.531 Western World Literature I (2 q.h.)

The Classical Age.

30.532 Western World Literature II (2 q.h.)

The Bible and the Middle Ages.

30.533 Western World Literature III (2 q.h.)

The Renaissance.

30.534 Western World Literature IV (2 q.h.)

The Neoclassical Age.

30.535 Western World Literature V (2 q.h.)

The Enlightenment.

30.536 Western World Literature VI (2 q.h.)

The Romantic Age and the rise of realism.

30.537 Modern Irish Literature I (2 q.h.)

Irish literature in English from 1885 to 1920 (fiction, drama, and verse). Concentration will be on such major figures as the early Yeats, Synge, Lady Gregory, O'Flaherty, and the early Joyce.

30.538 Modern Irish Literature II (2 q.h.)

Irish literature in English from 1920 to the present (fiction, drama, and verse). Concentration will be on such major figures as the later Yeats, O'Casey, O'Faoilain, the later Joyce, O'Connor, Behan, Lavin, and Montague.

30.539 The Irish Influence in Selected Modern American Literature (2 q.h.)

A survey of the Irish imagination, themes, and attitudes as embodied in the fiction and drama of a number of Twentieth-Century American writers: O'Neill's "Touch of the Poet," Donleavy's "Ginger Man," O'Connor's "Last Hurrah," Alfred's "Hogan's Goat," and McHale's "Farragan's Retreat." (Partially fulfills American Literature requirement for majors).

30.541 English Literature I (2 q.h.)

From early English to 1700.

30.542 English Literature II (2 q.h.)

From Neoclassicism to Romanticism.

30.543 English Literature III (2 q.h.)

From the Victorian Age to the present.

30.544 American Literature I (2 q.h.)

From Colonial times to Poe.

30.545 American Literature II (2 q.h.)

The American Renaissance: Emerson, Thoreau, Hawthorne, Melville, and Whitman.

30.546 American Literature III (2 q.h.)

From 1865 to the present.

30.547 Science Fiction (2 q.h.)

The myths and rhetorical strategies of science fiction from Mary Shelley's *Frankenstein* through such authors as Vonnegut, Bradbury, Heinlein, and Clarke.

30.548 Images of Women in Literature (2 q.h.)

A descriptive and analytic study of the images of women and the archetypes underlying them in imaginative literature, including such writers as Homer, Austen, Ibsen, Lawrence, Mailer, and Plath.

30.551 Chaucer I (2 q.h.)

"The Canterbury Tales," with attention to Middle English vocabulary, historical setting, and the rhythms and devices of Chaucer's poetry.

30.552 Chaucer II (2 q.h.)

More of "The Canterbury Tales," and a beginning in the text of "Troilus and Criseyde." Prereq. 30.551 or equiv.

30.553 Chaucer III (2 q.h.)

An emphasis on "Troilus and Criseyde," and on certain shorter works of Chaucer. Prereq. 30.552 or equiv.

30.554 Shakespeare I (2 q.h.)

The Elizabethan theatre, Shakespeare's England, and the pre-1600 plays.

30.555 Shakespeare II (2 q.h.)

The "problematical" comedies and the histories. Prereq. 30.554 or equiv.

30.556 Shakespeare III (2 q.h.)

Emphasis on the major tragedies of Shakespeare. Prereq. 30.555 or equiv.

30.557 The Seventeenth Century (2 q.h.)

The literature of the Restoration.

30.558 The Eighteenth Century I (2 q.h.)

The age of Pope and Swift.

30.559 The Eighteenth Century II (2 q.h.)

The age of Johnson.

30.561 Spenser (2 q.h.)

"The Faerie Queene," studied as the English culmination of Medieval and Renaissance romantic narrative.

30.562 Milton (2 q.h.)

Close reading of "Paradise Lost," and of such political and theological background as needed. "Samson Agonistes" will also be read.

30.564 The Old Testament I (2 q.h.)

Selected books from the Old Testament examined for their literary and historical importance.

30.565 The Old Testament II (2 q.h.)

Continuation of 30.564.

30.566 The New Testament (2 q.h.)

Selected books from the New Testament considered in their literary and historical aspects.

30.571 The Nineteenth Century I (2 q.h.)

Wordsworth and Coleridge.

30.572 The Nineteenth Century II (2 q.h.)

Byron, Shelley, and Keats.

30.573 The Nineteenth Century III (2 q.h.)

The Victorian Age.

30.574 The Eighteenth-Century English Novel (2 q.h.)

From Defoe to Austen.

30.575 The Nineteenth-Century English Novel (2 q.h.)

From Bronte to Hardy.

30.576 The Twentieth-Century English Novel (2 q.h.)

From Conrad to the present.

30.577 Conrad (2 q.h.)

Conrad's art related to his Polish heritage, nautical career, theory of life and composition, and literary legacy.

30.578 Afro-American Literature (2 q.h.)

A study of representative black authors of the United States, emphasizing the period from the Civil War to the present.

30.581 The American Short Story (2 q.h.)

The development of the American short story from its nineteenth-century origins to the present.

30.582 The Nineteenth-Century American Novel (2 q.h.)

From Cooper to Crane.

30.583 The Twentieth-Century American Novel (2 q.h.)

From Dreiser to the present.

30.584 Contemporary American Poetry (2 q.h.)

From Frost to the present.

30.585 The Modern European Novel (2 q.h.)

From Proust to the present.

30.586 Literary Criticism (2 q.h.)

Major schools of criticism through a study of Aristotle, Longinus, Sidney, Johnson, and a representative group of moderns.

30.590 Writers' Conference (2 q.h.)

A workshop in which professional writers will analyze participants' manuscripts.

30.591 Honors Program I (4 q.h.) See page 80.

30.592 Honors Program II (4 q.h.) Prereq. 30.591.

30.593 Honors Program III (4 q.h.) Prereq. 30.592.

30.600 Element of Composition (2 q.h.)

An intensive study of grammatical forms and structural patterns of current English.

30.601 Composition and Rhetoric I (2 q.h.)

A detailed examination of the modes of rhetoric, especially exposition and argument, and exercises in the development of paragraphs and short papers. (Not open to students who have credit for 30.504.)

30.602 Composition and Rhetoric II (2 q.h.)

A continuation of 30.601. The stress here is on the short paper, the longer library paper, and formal documentation. (Not open to students who have credit for 30.505.)

30.603 Composition and Rhetoric (Intensive) (4 q.h.)

Same as 30.601 plus 30.602.

30.604 Introduction to Literary Forms I (2 q.h.)

The development of techniques for reading imaginative writing. Short and long fiction are the materials for study, discussion, and two critical papers.

30.605 Introduction to Literary Forms II (2 q.h.)

A continuation of 30.604, but here the materials are poetry and drama.

30.606 Introduction to Literary Forms (Intensive) (4 q.h.)

Same as 30.604 plus 30.605.

30.607 The Modern Novel (2 q.h.)

An introductory course in the structure and themes of twentieth-century American, British, and European novels; reading of such writers as Hemingway, and Faulkner, Joyce and Lawrence, Kafka and Camus.

31—FRENCH

Consultant: Prof. L. Cooperstein, Chairman, Modern Language Dept. (L.A. College)

31.601 Elementary French I (4 q.h.)

Essentials of grammar, practice in pronunciation, and progressive acquisition of a basic vocabulary and idiomatic expressions.

31.602 Elementary French II (4 q.h.)

Continuation of grammar study. Oral and written exercises. Prereq. 31.601 or equiv.

31.603 Elementary French III (4 q.h.)

Reading of French prose of increasing difficulty, with written and oral exercises based on the materials read; practice in conversation. Prereq. 31.602 or equiv.

31.604 Intermediate French I (4 q.h.)

A review of grammar, with practice in composition and conversation. Prereq. 31.603 or equiv.

31.605 Intermediate French II (4 q.h.)

History of French civilization, with discussions and conversation. Prereq. 31.604 or equiv.

31.606 Intermediate French III (4 q.h.)

Intensive reading of modern French prose, with conversational practice. Prereq. 31.605 or equiv.

31.607 Elementary French (Intensive) (12 q.h.)

Stresses the essentials of grammar, practice in pronunciation, and progressive acquisition of a basic vocabulary with idiomatic expressions. Written and oral exercises are based upon simple French prose. Develops into the reading of more difficult work accompanied by practice in conversation. Not open to students who have taken 31.601, 31.602, 31.603.

31.608 Intermediate French (Intensive) (12 q.h.)

Same as 31.604, 31.605 and 31.606. Not open to students who have taken 31.604, 31.605, 31.606.

31.521 French Literature I (2 q.h.)

Origins of French literature with readings from major works of the Middle Ages. Prereq. 31.506 or equiv.

31.522 French Literature II (2 q.h.)

Selections from the Classical period in the seventeenth and eighteenth centuries. Prereq. 31.521 or equiv.

31.523 French Literature III (2 q.h.)

Readings from major works of the nineteenth and twentieth centuries. Pre-req. 31.522 or equiv.

32—SPANISH

32.601 Elementary Spanish I (4 q.h.)

Essentials of grammar, practice in pronunciation, progressive acquisition of a basic vocabulary and idiomatic expressions.

32.602 Elementary Spanish II (4 q.h.)

Continuation of grammar study. Oral and written exercises; reading of Spanish prose of moderate difficulty. Prereq. 32.601 or equiv.

32.603 Elementary Spanish III (4 q.h.)

Continuation of grammar study. Oral and written exercises; reading of Spanish prose of moderate difficulty. Prereq. 32.602 or equiv.

32.607 Elementary Spanish (Intensive) (12 q.h.)

Stresses the essentials of grammar, practice in pronunciation, and progressive acquisition of a basic vocabulary with idiomatic expressions. Written and oral exercises are based upon simple Spanish prose. Develops into the reading of more difficult work accompanied by practice in conversation. Not open to students who have taken 32.601, 32.602, 32.603.

32.604 Intermediate Spanish I (4 q.h.)

Review of grammar, with practice in composition and conversation. Prereq. 32.603, 32.611 or equiv.

32.605 Intermediate Spanish II (4 q.h.)

Spanish civilization through texts of average difficulty. Intensive reading of modern prose, with occasional oral or written translation; conversation practice based on assigned readings. Prereq. 32.604 or equiv.

32.606. Intermediate Spanish III (4 q.h.)

Spanish-American civilization through texts of average difficulty. Intensive reading of modern prose, with occasional oral or written translation; conversation practice based on assigned readings. Prereq. 32.605 or equiv.

32.608 Intermediate Spanish (Intensive) (12 q.h.)

Same as 32.604, 32.605 and 32.606. Not open to students who have had 32.604, 32.605, 32.606.

32.609 Conversational Spanish I* (4 q.h.)

This course is intended to provide students with a basic speaking ability and understanding of everyday Spanish. (no previous background needed.)

32.610 Conversational Spanish II* (4 q.h.)

Continued building of basic skills in conversational Spanish. Prereq. 32.609 or equiv.

32.611 Conversational Spanish III* (4 q.h.)

A continuation of 32.610 Prereq. 32.610 or equiv.

32.621 Spanish Literature I (2 q.h.)

Origins of Spanish literature with readings from major works of the Middle Ages, the Romancero, and Mysticism. Prereq. 32.606 or equiv.

32.622 Spanish Literature II (2 q.h.)

Selections from Cervantes and other major figures of the Siglo de Oro. Prereq. 32.621 or equiv.

32.623 Spanish Literature III (2 q.h.)

Readings from major works of the nineteenth and twentieth centuries. Prereq. 32.622 or equiv.

33—GERMAN

33.601 Elementary German I (4 q.h.)

Essentials of grammar; practice in pronunciation; progressive acquisition of a basic vocabulary and idiomatic expressions.

33.602 Elementary German II (4 q.h.)

More difficult points of grammar—particularly uses of subjunctive mood. Prereq. 33.601 or equiv.

33.603 Elementary German III (4 q.h.)

Reading of simple German prose, with oral and written exercises based on material read; German conversation encouraged. Prereq. 33.602 or equiv.

33.604 Intermediate German I (4 q.h.)

A review of grammar, with practice in composition and conversation. Prereq. 33.603 or equiv.

33.605 Intermediate German II (4 q.h.)

History of German civilization, with discussions and conversation. Prereq. 33.604 or equiv.

33.606 Intermediate German III (4 q.h.)

Intensive reading of modern German prose, with conversational practice. Prereq. 33.605 or equiv.

*Will satisfy the elementary language requirement only.

34—RUSSIAN

34.601 Elementary Russian I (4 q.h.)

Essentials of grammar; practice in pronunciation and progressive acquisition of a base vocabulary; idiomatic expressions.

34.602 Elementary Russian II (4 q.h.)

Continuation of grammar study; oral and written exercises. Prereq. 34.601 or equiv.

34.603 Elementary Russian III (4 q.h.)

Reading of Russian prose of moderate difficulty. Prereq. 34.602 or equiv.

34.604 Intermediate Russian I (4 q.h.)

Graded reading from the works of Pushkin, Lermontov, and Turgenev; oral and written practice based on the covered material. Prereq. 34.603 or equiv.

34.605 Intermediate Russian II (4 q.h.)

Russian history and civilization through texts of average difficulty; oral practice and composition based on covered material. Prereq. 34.604 or equiv.

34.606 Intermediate Russian III (4 q.h.)

Russian history and civilization through texts of average difficulty; oral practice and composition based on covered material. Prereq. 34.605 or equiv.

34—JAPANESE

34.621 Elementary Japanese I (4 q.h.)

Essentials of grammar; practice in pronunciation and progressive acquisition of a basic vocabulary; idiomatic expressions.

34.622 Elementary Japanese II (4 q.h.)

Continuation of grammar study; oral and written exercises. Prereq. 34.621 or equiv.

34.623 Elementary Japanese III (4 q.h.)

Reading of Japanese prose of moderate difficulty. Prereq. 34.622 or equiv.

34.624 Intermediate Japanese I (4 q.h.)

Review of grammar, with practice in composition and conversation. Prereq. 34.623 or equiv.

34.625 Intermediate Japanese II (4 q.h.)

Japanese history and civilization through texts of average difficulty; oral practice and composition based on covered material. Prereq. 34.624 or equiv.

34.626 Intermediate Japanese III (4 q.h.)

Japanese history and civilization through texts of average difficulty; oral practice and composition based on covered material. Prereq. 34.625 or equiv.

34—ITALIAN**34.631 Elementary Italian I (4 q.h.)**

Essentials of grammar; practice in pronunciation; and progressive acquisition of a basic vocabulary and idiomatic expressions.

34.632 Elementary Italian II (4 q.h.)

Continuation of grammar study. Oral and written exercises. Prereq. 34.631 or equiv.

34.633 Elementary Italian III (4 q.h.)

Reading of Italian prose of increasing difficulty; with written and oral exercises based on the material read; practice in conversation. Prereq. 34.632 or equiv.

34.634 Intermediate Italian I (4 q.h.)

A review of grammar, with practice in composition and conversation. Prereq. 34.633 or equiv.

34.635 Intermediate Italian II (4 q.h.)

History of Italian civilization with discussions and conversation. Prereq. 34.634 or equiv.

34.636 Intermediate Italian III (4 q.h.)

Intensive reading of modern Italian prose, with conversational practice. Prereq. 34.635 or equiv.

34—SWAHILI**34.641 Elementary Swahili I (4 q.h.)**

Essentials of grammar; practice in pronunciation and progressive acquisition of a basic vocabulary; idiomatic expressions.

34.642 Elementary Swahili II (4 q.h.)

Continuation of grammar study; oral and written exercises. Prereq. 34.641 or equiv.

34.643 Elementary Swahili III (4 q.h.)

Reading of Swahili prose of moderate difficulty. Prereq. 34.642 or equiv.

34.644 Intermediate Swahili I (4 q.h.)

Review of grammar, with practice in composition and conversation. Prereq. 34.643 or equiv.

34.645 Intermediate Swahili II (4 q.h.)

Swahili history and civilization through texts of average difficulty; oral practice and composition based on covered material. Prereq. 34.644 or equiv.

34.646 Intermediate Swahili III (4 q.h.)

Swahili history and civilization through texts of average difficulty; oral practice and composition based on covered material. Prereq. 34.645 or equiv.

34—CHINESE**34.651 Mandarin Chinese I (4 q.h.)**

An introduction to sounds and structure of spoken and written Chinese (the standard or "national language"—kuo-yu). Stresses essentials of grammar, sentence pattern drills.

34.652 Mandarin Chinese II (4 q.h.)

Continuation of Chinese I. Essentials of grammar, reading of simple written Chinese. Prereq. 34.651 or equiv.

34.653 Mandarin Chinese III (4 q.h.)

Continuation of Chinese II. Grammar, reading Chinese with conversational drill to be based on material covered in class. Prereq. 34.652 or equiv.

38—JOURNALISM

Consultant: Prof. G. A. Speers, Chairman, Journalism Dept. (L.A. College)

38.501 History and Principles of Journalism I (2 q.h.)

Journalism from its European origins into the colonial period. The evolution of press freedoms and principles now and in the colonial press and the party press.

38.502 History and Principles of Journalism II (2 q.h.)

Journalism from 1800. The "Dark Period," the "Penny Press," and the great personal journalists: Bryant, Bennett, Greeley, Raymond, and others. Prereq. 38.501 or equiv.

38.503 History and Principles of Journalism III (2 q.h.)

The "giants" of American journalism in the closing decades of the nineteenth century: Dana, Greeley, Ochs, White, Medill, Pulitzer, Hearst, and others. Prereq. 38.502 or equiv.

38.504 Newswriting I (2 q.h.)

Obtaining and organizing facts; the writing of basic news stories. Subjects covered include the five "W's" and the "H" of news, inverted pyramid form news values, and leads.

38.505 Newswriting II (2 q.h.)

Analysis of different types of news stories through assignments and class discussions; building news stories; news interview stories, and other types. Pre req. 38.504.

38.506 Newswriting III (2 q.h.)

Investigative reporting, feature stories, editorials. Copy editing exercises and assignments in specialized writing. Libel, slander, and other legal matter affecting journalism. Prereq. 38.505 or equiv.

38.507 Techniques of Journalism I (2 q.h.)

Techniques of journalism, stressing actual assignments and classroom discussion of students' work. Course applies basic newswriting practices to assignments.

38.508 Techniques of Journalism II (2 q.h.)

Focus on handling stories that emanate from various "beats," including courts, government beats, and investigative reporting. Prereq. 38.507 or equiv.

38.509 Techniques of Journalism III (2 q.h.)

Concentration on fields of "specialties" of business, sports, editorials, and student development of a special project in journalism. Prereq. 38.508 or equiv.

39—ECONOMICS

Consultant: Prof. M. A. Horowitz, Chairman, Economic Dept. (L.A. College)

Associate Consultant: Prof. H. Goldstein (L.A. College)

39.501 Economic Principles and Problems I (2 q.h.)

Macro analysis—national income concepts and determination; macro economic goals and problems; monetary and fiscal policy.

39.502 Economic Principles and Problems II (2 q.h.)

Micro analysis—theory of the firm and market structure; supply, demand, market price; international economics. Prereq. 39.501 or equiv.

39.503 Economic Principles and Problems III (2 q.h.)

Applications of economic principles to selected problem areas: poverty, competition, labor, agriculture, urban. Prereq. 39.502 or equiv.

39.504 Economics (Intensive) (6 q.h.)

Macro analysis—national income concepts and determination; macro economic goals and problems; monetary and fiscal policy. Micro analysis—theory of the firm and market structure; supply, demand, market price; international economics. Applications of economic principles to selected problem areas: poverty, competition, labor, agriculture, urban. Not open to students who have taken 39.501, 39.502, 39.503.

39.505 Economics A (3 q.h.)

Same as 39.501 plus the first half of 39.502.

39.506 Economics B (3 q.h.)

Same as the second half of 39.502 plus 39.503. Prereq. 39.505 or equiv.

39.507 Intermediate Economic Theory I (2 q.h.)

Classical equilibrium theory. Theory of demand, supply, and the market price. Marginal analysis. Prereq. 39.503 or equiv.

39.508 Intermediate Economic Theory II (2 q.h.)

Determination of price and output in the context of the theory of the firm. Prereq. 39.507 or equiv.

39.509 Intermediate Economic Theory III (2 q.h.)

Introduction to mathematical analysis and a comprehensive analysis of the theory of distribution. Prereq. 39.508 or equiv.

39.511 Statistics I (2 q.h.)

Introduction to the collection and organization of data. Concentration on the nature, computation, and uses of measures of central tendency and variability. Prereq. 39.503 or equiv.

39.512 Statistics II (2 q.h.)

Introduction to statistical inference, parameters of samples, tests of significance, "t" distribution, and chi square. Prereq. 39.511 or equiv.

39.513 Statistics III (2 q.h.)

Introduction to the analysis of variance, trend fitting, linear regression, seasonal adjustment, and index numbers. Prereq. 39.512 or equiv.

39.514 Statistics (Intensive) (6 q.h.)

Introduction to the collection and organization of data. Concentration on the nature, computation, and uses of measures of central tendency and variability. Introduction to statistical inference, parameters of samples, tests of significance, "t" distribution, and chi square. Introduction to the analysis of variance, trend fitting, linear regression, seasonal adjustment, and index numbers. Not open to students who have taken 39.511, 39.512, 39.513. Prereq. 39.503 or equiv.

39.517 Money and Banking I (2 q.h.)

Introduction to money and credit, commercial banking structure, and money creation; problems and policy of central banking in the United States. Prereq. 39.503 or equiv.

39.518 Money and Banking II (2 q.h.)

Theory of money and prices and monetary policy; interest theory, debt management, and international monetary problems and analysis. Prereq. 39.517 or equiv.

39.519 Public Finance (2 q.h.)

Analysis of the growth and development of the public sector of the economy. Public finance policies, intergovernment fiscal relations. Prereq. 39.518 or equiv.

39.521 Economic Growth and Development I (2 q.h.)

Analysis of the development of the western market system. Introduction to economic growth and alternative approaches to economic development. Prereq. 39.503 or equiv.

39.522 Economic Growth and Development II (2 q.h.)

An introductory analysis of the role of economic factors and institutions as well as an examination of the effect of psychological social and political influences upon economic development. Prereq. 39.521 or equiv.

39.523 Government and Business I (2 q.h.)

Role of Government in national economic affairs—theory and practice. Prereq. 39.503 or equiv.

39.524 Government and Business II (2 q.h.)

The relationship between government and business and anti-trust laws. Prereq. 39.523 or equiv.

9.525 American Economic History (2 q.h.)

Economic development of the United States with emphasis upon the post Civil War period and selected European developments. Prereq. 39.503 or equiv.

9.526 Government and Business III (2 q.h.)

Application of anti-trust laws to business—emphasis upon cases, principles, and current anti-trust problems. Prereq. 39.524 or equiv.

9.527 Labor Economics (2 q.h.)

Development of labor organizations, their aims and methods. Issues in collective bargaining and public policy toward labor. Prereq. 39.503 or equiv.

9.528 International Economics I (2 q.h.)

Economics of international trade, tariffs and resource use, and balance of payments mechanisms. Prereq. 39.503 or equiv.

9.529 International Economics II (2 q.h.)

International commercial policy, financial organizations, and recent problems. Prereq. 39.528 or equiv.

9.530 Comparative Economic Systems (2 q.h.)

Analysis and evaluation of different economic systems: capitalism, socialism, communism, and fascism. Prereq. 39.503 or equiv.

9.531 Business Cycles I (2 q.h.)

Intermediate macro economic theory. Theory of cyclical fluctuations in the context of multiplier and accelerator models. Prereq. 39.503 or equiv.

9.532 Business Cycles II (2 q.h.)

Business cycle analysis, measurement, and public policy. Prereq. 39.531 or equiv.

9.533 Business Cycles III (2 q.h.)

Business cycle forecasting methods and services. Prereq. 39.532 or equiv.

9.536 Advanced Statistics I (2 q.h.)

Advanced topics in sampling and statistical inference as a management aid. Prereq. 39.503, 39.513 or equiv.

9.537 Advanced Statistics II (2 q.h.)

Elements in probability theory and the decomposition of economic change into secular, seasonal, and cyclical variation. Prereq. 39.536 or equiv.

9.538 Advanced Statistics III (2 q.h.)

Advanced topics in statistical inference, regression, and correlation and index numbers. Prereq. 39.537 or equiv.

9.539 Managerial Economics (2 q.h.)

An application of the theory of demand, price, and output to the business firm and capital budgeting. Prereq. 39.503 or equiv.

9.540 History of Economic Thought (2 q.h.)

Development of economic theory through Keynesian and post-Keynesian analysis. Prereq. 39.503 or equiv.

39.551 Industrial Organization (2 q.h.)

An extension and application of micro-theory to structure and performance of American industry. Anti-trust policy and analysis. Prereq. 39.503 or equiv.

39.561 Urban Economics (2 q.h.)

A study of urban affairs in the context of economic principles. Prereq. 39.503 or equiv.

39.571 European Economic History (2 q.h.)

An analysis of European economic affairs after the industrial revolution. The twentieth century and recent integration policies and their analysis. Prereq. 39.503 or equiv.

39.581 Economic Policy Seminar (2 q.h.)

Capstone course for senior majors with stress upon independent study and contemporary issues. Prereq. 39.509, 39.531 or equiv.

40—LIBRARY SCIENCE

Consultant: Mr. R. L. Waller, Attleboro Public Library

40.501 Introduction to Library Science (2 q.h.)

Brief survey of the history of books and librarianship. The development of libraries in the United States with some emphasis on recent federal and state library legislation. The library profession, its philosophy, publications, and organizations.

40.502 Selection of Library Materials (2 q.h.)

Principles and practices in the selection of multi-media materials for the modern library; bibliographic aids to selection; practice in preparation of book notes and book reviews.

40.511 Organization of the Library (2 q.h.)

The organization, administration, and services of municipal libraries; public library systems in the United States; the role of public libraries as educational institutions.

40.512 Multi-Media Centers (2 q.h.) (Formerly Building and Administering the School Library)

Organization and management of elementary and secondary school libraries problems in the selection and evaluation of multi-media materials necessary to the school curriculum.

40.513 Administration of Multi-Media Centers (2 q.h.) (Formerly School Library Administration)

The library as a media center for instructional materials; problems in personnel and budgeting; the library's role in the school curriculum and its services to students and faculty.

40.514 Multi-Media Materials and Services (2 q.h.) (Formerly Audio-Visual Materials and Services)

The selection, organization, and use of multi-media materials in school libraries types of equipment and services; cataloging of non-print materials.

40.521 Introduction to Reference Materials and Methods (2 q.h.)

The basic tools and methods for locating information. Evaluation of dictionaries, encyclopedias, gazetteers and atlases, handbooks, almanacs, directories, and indexes.

40.522 Reference Work in The Social Sciences (2 q.h.)

Scope and use of outstanding reference materials in the broad range of the social sciences—economics, education, political science, sociology, and allied fields. Prereq. 40.521 or equiv.

40.523 Reference Work in The Humanities (2 q.h.)

Development of the book, and the beginnings of enumerative and descriptive bibliography. Approaches to the solution of reference problems in the humanities, with special emphasis on literature. Prereq. 40.521 or equiv.

40.524 Reference Work in Science and Technology (2 q.h.)

The significant reference materials in science and technology: physics, chemistry, engineering, mathematics, electronics, geology, biology, medicine, oceanography, and environmental sciences.

40.526 Library Community Relations (2 q.h.)

An exploration of creative approaches and practical techniques for reaching individuals and groups with dynamic library science. Emphasis on modern public relations methods and media.

40.531 Descriptive Cataloging (2 q.h.)

Theory and practice of descriptive cataloging, introducing techniques of compiling author, corporate, and serial entries.

40.532 Subject Headings and Classification (2 q.h.) (Formerly Descriptive Cataloging and Classification)

Introduction to Dewey Decimal Classification and Sears subject headings; further study of descriptive cataloging in book and non-book materials. Prereq. 40.531 or equiv.

40.533 Library of Congress Classification (2 q.h.)

The significant differences between LC and Dewey. Notes on original cataloging and techniques of classification within the LC scheme. Use of LC outlines and tables. Prereq. 40.531 or equiv.

40.541 Introduction to Children's Literature (2 q.h.)

The history of children's literature; current trends in its publication and social forces that influence its production; criteria for evaluation and aids for selection of types of children's books.

40.542 Library Service to Young People (2 q.h.)

Study of adolescent needs in the field of literature with application to both public and school libraries; special attention to the problem of material selection, book talks, and discussion groups.

40.551 Special Libraries (2 q.h.)

The purpose and development of the special library—industrial, scientific, business, and other types; the acquisition and processing of special library materials.

BUSINESS ADMINISTRATION

All course descriptions carry an indication of which quarter(s) a particular course will be offered. Any course sequence not reporting an indication will have Part I offered in the Fall, Part II in the Winter, and Part III in the Spring Quarter. Please refer to the Schedule of Courses and Registration Guide for details.

41—ACCOUNTING

Consultant: Prof. J. W. Golemme, College of Business, 437-3244.

Coordinator: C. P. Carter, Asst. Prof., College of Business, 437-3245.

41.501 Accounting Principles I (2 q.h.) (Offered every quarter)

The basic concepts and methodology of accounting for service and merchandising businesses.

41.502 Accounting Principles II (2 q.h.) (Offered every quarter)

The problems of income measurement and valuation related to sources and uses of invested capital. Prereq. 41.501.

41.503 Accounting Principles III (2 q.h.) (Offered every quarter)

The use of debt and investments in managerial financial decisions, followed by a brief introduction into cost decision analysis. Prereq. 41.502.

41.504 Intermediate Accounting I (2 q.h.)

The study of generally accepted accounting principles as applicable to the preparation of financial statements. Accounting for cash, securities, and receivables. Prereq. 41.503.

41.505 Intermediate Accounting II (2 q.h.)

The use of various systems for accounting for the flow of inventory in a merchandising or manufacturing operation. Long term investments as a means of providing stability to the concern. Prereq. 41.504.

41.506 Intermediate Accounting III (2 q.h.)

The problems of long term asset acquisition and write-off through depreciation, amortization, and depletion methods. Prereq. 41.505.

41.507 Cost Accounting I (2 q.h.)

The foundations of cost accounting, including terminology, purposes, and relationship to financial accounting. Prereq. 41.503.

41.508 Cost Accounting II (2 q.h.)

The planning and control of current operations through the use of standard costs and budgets. Prereq. 41.507.

41.509 Cost Accounting III (2 q.h.)

The use of cost accounting in special decisions and in long range planning. Prereq. 41.508.

41.510 Advanced Accounting I* (2 q.h.)

The accounting problems encountered through the issuance of capital stock, both at issue date and at subsequent dates. Prereq. 41.506.

41.511 Advanced Accounting II* (2 q.h.)

The techniques of statement analysis, using both internal and external information. A complete examination of cash and fund flow as it is used by the accountant and the analyst. Prereq. 41.510.

41.512 Advanced Accounting III* (2 q.h.)

The introduction of special problems posed by partnerships, estates, and trusts. Prereq. 41.511.

41.513 Specialized Problems I* (2 q.h.)

The problems of accounting for special sales. Introduction of the concepts of present value and its use in accounting. Prereq. 41.512.

41.514 Specialized Problems II* (2 q.h.)

The use of consolidated statements in conjunction with newly developing trends toward multi-purpose companies, combinations, mergers, and pools. Prereq. 41.513.

41.515 Specialized Problems III* (2 q.h.)

The use of specialized systems and financial statements by companies. Prereq. 41.514.

41.516 Auditing I* (2 q.h.)

The examination of modern auditing requirements relative to the professional ethics and legal responsibility of the certified public accountant and the public accountant. Prereq. 41.512.

41.517 Auditing II* (2 q.h.)

The methods and approach used in auditing assets of the firm. Prereq. 41.516.

41.518 Auditing III* (2 q.h.)

The methods and approach used in auditing liabilities, owner equity, and nominal accounts of the firm. Prereq. 41.517.

41.519 Federal Income Taxes I* (2 q.h.)

The application of the Federal Tax Law to the individual's income, gains, losses and expenses. Prereq. 41.515.

41.520 Federal Income Taxes II* (2 q.h.)

The application of the Federal Tax Law to the individual's special deductions. Installment sales; income average. Prereq. 41.519.

41.521 Federal Income Taxes III* (2 q.h.)

The application of Federal Tax Law to corporations. Prereq. 41.520.

41.522 Seminar in Contemporary Accounting Problems* (2 q.h.)

The careful examination of the underlying concepts and conventions of accounting, and their application to financial statements. Prereq. 41.515, and 41.509.

41.523 Seminar in Contemporary Accounting Problems II* (2 q.h.)

The careful examination of the areas of revenue and income recognition, cost determination and allocation, and depreciation. *Prereq.* 41.522.

41.524 Seminar in Contemporary Accounting Problems III* (2 q.h.)

The careful examination of newly developing accounting areas such as pensions, leases, stock options, and business combinations. *Prereq.* 41.523.

41.525 Estate and Gift Taxes* (2 q.h.)

An examination of the relevant Internal Revenue Code provisions, property included in gross estate, including lifetime transfers which remain subject to some control by donor; marital and charitable deductions; administrative expenses; estate planning. *Prereq.* 41.521. (Offered Fall and Spring Quarters)

41.526 Corporate and Stockholder Tax Problems I* (2 q.h.)

Real estate transactions, stock market options, transfers of appreciated assets to donees, patents, sale of franchise rights, and redemptions of stock in closely held corporations. *Prereq.* 41.525. (Offered Winter Quarter)

41.527 Corporate and Stockholder Tax Problems II* (2 q.h.)

Contribution of assets, Section 301 distributions, preferred stock, partial liquidations, spin-offs; collapsible corporations, unreasonable accumulations, personal holding companies, and elements of reorganizations. *Prereq.* 41.526. (Offered Spring Quarter)

41.528 Tax Factors in Business Decisions* (2 q.h.)

An examination of the Federal Income Tax consequences of typical business decisions: form of enterprise; compensation policy; capitalization policy; corporate reorganizations, and other related areas. *Prereq.* 41.506. (Offered Fall and Spring Quarters)

41.533 Accounting for Management Decisions I (non-accounting majors) (2 q.h.)

The preparation and interpretation of financial statements, including cash and fund flow, for internal use by the company. *Prereq.* 41.503.

41.534 Accounting for Management Decisions II (non-accounting majors) (2 q.h.)

The preparation and interpretation of cost accounting information. *Prereq.* 41.533.

41.535 Accounting for Management Decisions III (non-accounting majors) (2 q.h.)

The utilization of accounting information for management decisions. *Prereq.* 41.534.

41.541 Accounting Principles (Intensive) (6 q.h.)

Basic concepts and methodology of accounting for service and merchandising businesses. The problems of income measurement and valuation related to sources and uses of invested capital. The use of debt and investments in managerial financial decisions, followed by a brief introduction into cost decision analysis. Not open to students who have taken 41.501, 41.502, 41.503. (Offered every quarter)

*Upper level Business Administration course—see page 54.

41.542 Intermediate Accounting (Intensive) (6 q.h.)

The study of generally accepted accounting principles as applicable to the preparation of financial statements. Accounting for cash, securities, and receivables. The use of various systems for accounting for the flow of inventory in a merchandising or manufacturing operation. Long term investments as a means of providing stability to the concern. The problem of long term asset acquisition of and write-off through depreciation, amortization, and depletion methods. Not open to students who have taken 41.504, 41.505, 41.506. Prereq. 41.503. (Offered Summer Quarter)

41.543 Accounting for Management Decisions (Intensive) (non-accounting majors) (6 q.h.)

The preparation and interpretation of financial statements, including cash and fund flow, for internal use by the company. The preparation and interpretation of cost accounting information and the utilization of accounting information for management decisions. Not open to students who have taken 41.533, 41.534, 41.535. Prereq. 41.503. (Offered Summer Quarter)

41.551, 41.552 Accounting (A), (B) (6 q.h.)

The basic concepts and methodology of accounting for service and merchandising businesses. The problems of income measurement and valuation related to sources and uses of invested capital. The use of debt and investments in managerial financial decisions, followed by a brief introduction into cost decision analysis. (Offered Fall and Winter Quarters)

43—MARKETING

Consultant: Prof. C. H. Dufton, Chairman, Marketing Department
College of Business Administration 437-3260

Coordinator: G. P. Foster, 749-1599

3.501 Introduction to Marketing I (2 q.h.)

Description and evaluation of the marketing system and an introduction to the decision-making process. (Offered every quarter)

3.502 Introduction to Marketing II (2 q.h.)

A continuation of Marketing I with emphasis upon specific marketing functions and their application through the use of case studies and analysis. Prereq. 3.501. (Offered every quarter)

3.503 Introduction to Marketing III (2 q.h.)

A continuation of the case method plus discussion and analysis of current marketing issues and problems. Prereq. 43.502. (Offered every quarter)

3.504 Introduction to Marketing (Intensive) (6 q.h.)

Description and evaluation of the marketing system and an introduction to the decision-making process, with emphasis upon specific marketing functions and their application through the use of case studies and analysis. A continuation of the case method plus discussion and analysis of current marketing issues and problems. Not open to students who have taken 43.501, 43.502, 43.503. Offered every quarter)

43.505, 43.506 Introduction to Marketing (A), (B) (6 q.h.)

A description and evaluation of the marketing system and an introduction to the decision-making process. A review of specific marketing functions and their application through the use of case studies and analysis. A continuation of the case method plus discussion and analysis of current marketing issues and problems. (Offered Fall and Winter Quarters)

43.507 Sales Management I (2 q.h.)

Through readings and case studies, the creation, management, and appraisal of the sales force are examined. In the first quarter of the course, emphasis is upon the principles, policies and structures of sales organization and the selection of salesmen. Prereq. 43.503.

43.508 Sales Management II (2 q.h.)

A continuation of 43.507 with emphasis upon sales force operation, including communication, sales training, compensation, expenses, supervision, morale, and stimulation. Prereq. 43.507.

43.509 Sales Management III (2 q.h.)

In this concluding quarter of the course, emphasis is upon sales planning: market potential, sales forecast, sales budgets, territories, quotas; sales analysis: sales volume, marketing cost, performance; and the sales manager. Prereq. 43.508.

43.511 Creative Marketing Communications I (2 q.h.)

The principles of advertising and sales promotion and how they are used with maximum efficiency as communications and motivational functions of the marketing mix. Prereq. 43.503.

43.512 Creative Marketing Communications II (2 q.h.)

A study of specific advertising and sales promotion techniques in various media, with emphasis on the development of creative concepts as an important part of sales and marketing strategy. Prereq. 43.511.

43.513 Creative Marketing Communications III (2 q.h.)

Case histories and contemporary projects are used for improving ability to develop creative advertising and sales promotion strategies in support of overall sales and marketing goals. Prereq. 43.512.

43.514 Marketing Fundamentals I (Industrial Technology majors only.) (2 q.h.)

A description of the role of marketing in the modern business firm and an introduction to basic marketing strategies. (Offered Fall and Winter Quarters)

43.515 Marketing Fundamentals II (Industrial Technology majors only.) (2 q.h.)

A continuation of Marketing Fundamentals I with emphasis upon specific marketing functions and the evaluation and control of the marketing effort. (Offered Winter and Spring Quarters)

43.518 Retailing and Mass Merchandising I (2 q.h.)

The marketing concept and retail management, retail profit and loss. Starting a retail business, store location, store planning, and the retail organization.

43.519 Retailing and Mass Merchandising II (2 q.h.)

Merchandising planning and control, pricing, and buying. Prereq. 43.518.

43.522 Retailing and Mass Merchandising III (2 q.h.)

Distribution of merchandise, sales promotion, customers' services, retail accounting, and expense management. Prereq. 43.519.

43.520 Industrial Marketing (2 q.h.)

The marketing of products where other business firms and organizations are the customers, including a study of physical distribution, marketing concepts, and the decision-making process relevant to the marketing of business goods. Prereq. 43.503. (Offered Fall Quarter)

43.525 Marketing Research I* (2 q.h.)

Introductory presentation and evaluation of procedures and techniques currently available to improve the chances of marketing success and effectiveness. Prereq. 43.503, 39.513, 45.572. (Offered Fall Quarter)

43.526 Marketing Research II* (2 q.h.)

Modern techniques of data collection and analysis, both quantitative and qualitative, in marketing research, forecasting, product planning, test marketing, marketing evaluation, and the application of modern data-processing techniques. Prereq. 43.525. (Offered Winter Quarter)

43.529 International Marketing (2 q.h.)

Opportunities, methods, and policies required for the successful development and management of international business and marketing operation. Prereq. 43.503. (Offered Winter Quarter)

43.530 Consumer Behavior Seminar (2 q.h.)

Economic, behavioral, and other models of consumer behavior are examined as bases for the planning and evaluation of marketing effort. Prereq. 43.503. (Offered Spring Quarter)

43.532 Marketing Management I* (2 q.h.)

Advanced management and decision-making covering the complete marketing spectrum are analyzed in a variety of case studies and problems. Prereq. 43.503.

43.533 Marketing Management II* (2 q.h.)

Using a seminar-type approach, emphasis is placed upon problem-solving in such areas as sales, logistics and physical distribution, advertising, pricing, new development, public and governmental policy. Prereq. 43.532.

43.534 Marketing Management III* (2 q.h.)

A continuation of Marketing Management II, with increased emphasis upon case analysis and study. Prereq. 43.533.

43.536 Introduction to Advertising (2 q.h.)

A broad survey of advertising and how it contributes to business activity, and to our society and culture, with emphasis on the principles involved in its increasing importance as a major form of communications and motivation. (Offered Spring Quarter)

43.537 Marketing and Sales Seminar* (2 q.h.)

A one-quarter, cap-stone course to round out the student's study of marketing through investigation and analysis of the most recent trends in marketing management, finance, logistics, sales, advertising, and promotion. Prereq. 43.534. (Offered Spring Quarter)

43.541 Public Relations I (2 q.h.)

Introduction to the basic principles, purposes, and methods of public relations. Prereq. 43.503. (Offered Fall Quarter)

43.542 Public Relations II (2 q.h.)

A continuation of Public Relations I providing in-depth coverage of the planning, management, operation, and evaluation of public relations programs, including case analysis. Prereq. 43.541. (Offered Winter Quarter)

43.543 Salesmanship I (2 q.h.)

Opportunities in personal selling for both men and women; the importance in the marketing mix; introduction to broadly applicable principles for all types of selling. Prereq. 43.503. (Offered Fall Quarter)

43.544 Salesmanship II (2 q.h.)

Development of techniques as required for the personal selling of goods and services through middlemen and direct to the consumer. Both industrial and consumer channels are studied. Prereq. 43.543. (Offered Winter Quarter)

44—FINANCE AND INSURANCE

Finance

Consultant: Prof. R. J. Hehre, College of Business 437-3248

Coordinator: W. F. Hancock, Jr. 359-4281

44.501 Finance and Risk Management I (2 q.h.)

A survey of major financial institutions and their role within the economy. Special emphasis is given to the dollar supply, commercial banking, the Federal Reserve System, and savings institutions. Prereq. 41.503. (Offered every quarter)

44.502 Finance and Risk Management II (2 q.h.)

A study of security markets and investment institutions. The student is introduced to stocks, bonds, investment companies, and trust companies. (Offered every quarter)

44.503 Finance and Risk Management III (2 q.h.)

This course is intended to acquaint each student with personal, property, and liability risks, and the forms of insurance designed to meet these risks. The emphasis is placed on basic insurance principles inherent in life, homeowners and automobile coverage. (Offered every quarter)

*Upper level Business Administration course—see page 54.

44.504 Principles of Finance, Investment, Insurance and Risk Management (Intensive) (6 q.h.)

Same as 44.501, 44.502 and 44.503. Not open to students who have taken those courses. (Offered Winter, Spring and Summer Quarters)

44.505 Corporate Finance (Intensive) (6 q.h.)

An introduction to the role of financial management of the business firm. Review of financial statements, promotion, and forms of organization. Planning the use of assets and cost of capital concepts are introduced as management evaluation techniques. An analytical approach to capital budgeting and optimum asset returns. Cost of capital is further developed and applied against consideration of capital mixture. Not open to students who have taken 44.507, 44.508, 44.509. Prereq. 44.501. (Offered Winter and Summer Quarters)

44.507 Corporate Finance I (2 q.h.)

An introduction to the role of financial management of the business firm. Review of financial statements promotion, and forms of organization. Planning the use of assets and cost of capital concepts are introduced as management evaluation techniques. Prereq. 41.503, 44.501.

44.508 Corporate Finance II (2 q.h.)

An analytical approach to capital budgeting and optimum asset returns. Cost of capital is further developed and applied against consideration of capital mixture. Prereq. 44.507.

44.509 Corporate Finance III (2 q.h.)

The analysis of various financial tools are considered. An intensive examination of short and intermediate term credit, as well as the distribution of stocks and bonds to the public and special buyers. A survey of reorganization and liquidation techniques are analyzed. Prereq. 44.508.

44.517 Investments I* (2 q.h.)

Investment goals and objectives are considered. Various types of investments are compared and the role of the securities markets examined. Prereq. 44.509.

44.518 Investments II* (2 q.h.)

Broad coverage of the relationship between the economy and stock price averages. Methods of analyzing and appraising developments within the corporation as they apply to the investment analyst's techniques. Prereq. 44.517.

44.519 Investments III* (2 q.h.)

The relation of earnings, dividends, and cash flow to market valuation of a company's securities. Portfolio analysis and planning are examined, as well as methods of security selection. Technical and fundamental factors are also considered. Prereq. 44.518.

44.521 Credit Management I* (2 q.h.)

An introduction to credit and its functions, including the role of the credit executive, credit investigation, documentary credit, trade credit. Prereq. 44.509.

*Upper level Business Administration course—see page 54.

44.522 Credit Management II* (2 q.h.)

The organization and function of credit departments; various forms of credit and collection services. Prereq. 44.521.

44.523 Credit Management III* (2 q.h.)

Analysis of financial statements to determine credit worthiness, creditor's rights, adjustment bureau, credit insurance, and guarantees. Prereq. 44.522.

44.531, 44.532 Seminar in Finance I, II* (4 q.h.)

Student participation in the study and analysis of case histories. Individual papers presented. Prereq. All finance courses. (Offered Fall and Winter Quarters)

44.533 International Finance I (2 q.h.)

Introduction to international financial management in the multi-national corporation. Analysis of the basic problems and finance considerations involved with international investments, trade, and payments. Planning in the international environment related to exchange rates, currency revaluations, inflation, and local government policies. Prereq. 44.507 or consent of instructor. (Offered Fall Quarter)

44.534 International Finance II (2 q.h.)

Analysis of the financial strategy involved with international investment alternatives, sources of capital, working capital management, fund flows, and management control through accounting and financial reporting. Prereq. 44.533. (Offered Winter Quarter)

44.535 Investments (Intensive) (6 q.h.)

Investment goals and objectives are considered. Various types of investments are compared and the role of the securities markets examined. Broad coverage of the relationship between the economy and stock price averages. Methods of analyzing and appraising developments within the corporation as they apply to the investment analyst's techniques. The relation of earnings, dividends, and cash flow to market valuation of a company's securities. Portfolio analysis and planning are examined, as well as methods of security selection. Technical and fundamental factors are also considered. Not open to students who have taken 44.517, 44.518, 44.519. Prereq. 44.509. (Offered Spring and Summer Quarters)

44.544 Law of Finance* (2 q.h.)

A consideration of the legal problems immediately affecting finance. Special attention is given to the field of corporate law. Prereq. 44.509, 45.543. (Offered Spring Quarter)

44.545 Profit Planning and Control I* (2 q.h.)

An intensive treatment of managerial planning, budgetary control, and financial analysis. Emphasis is placed on the interrelationship between functional areas in an organization using consolidated profit planning as an integrating device.

*Upper level Business Administration course—see page 54.

Students will utilize materials studied in earlier courses. Topics covered include fundamental financial analysis, comprehensive profit planning and control, general expense planning and control, production planning, materials planning and control, purchasing direct, etc. Prereq. 41.506, 44.509 or equiv. (Offered Fall Quarter)

44.546 Profit Planning and Control II* (2 q.h.)

Topics covered include development and application of variable budgets, planning and controlling capital expenditures, computer applications in profit planning, cash flow planning and control, cost-profit-volume analysis, performance reporting and analysis of budget variations. Prereq. 44.545. (Offered Winter Quarter)

44.547 Advanced Financial Problems* (2 q.h.)

An in-depth examination of two complex but vital financial areas. Failure and re-organization, and merger and consolidation. Students will devote considerable time to studying the legal relationships and requirements of both areas as their business implications. Prereq. 44.509 or equiv. (Offered Spring Quarter)

44.548 Capital Strategy (2 q.h.)

Focuses on the matters of capital budgeting and the related capital structure problems with particular emphasis on the role of the cost of capital in long range decision-making. The processes by which investment decisions and financing decisions are made, as well as sources of long-term funds are examined. (Offered every quarter)

Insurance

Coordinator: Mr. C. W. Earnshaw 437-2506

44.511 Life Insurance I (2 q.h.)

A study of the origin, development, and basis of modern life insurance. Analysis and comparison of the various policies and riders and their uses. (Offered Fall Quarter)

44.512 Life Insurance II (2 q.h.)

The fundamentals of programming, including beneficiary designations, settlement options, and tax implications. Company organization and operations: underwriting, investments, and regulations. (Offered Winter Quarter)

44.513 Estate Planning and Business Insurance (2 q.h.)

The use of insurance to meet the needs of the various types of business organizations. The planning, disposition, administration, and taxation of testamentary and intervivos transfers of property. (Offered Spring Quarter)

44.514 Property & Casualty Insurance I (2 q.h.)

The basis of modern property-casualty insurance. Analysis of the insurance contract, its application, meaning, and rating.

*Upper level Business Administration course—see page 54.

44.515 Property & Casualty Insurance II (2 q.h.)

Study of various policies including automobile, homeowners, inland marine, and commercial special multi-peril. Prereq. 44.514.

44.516 Property & Casualty Insurance III (2 q.h.)

A study of the mechanics of the insurance industry, including types of companies, reserves, reinsurance, financial analysis, and government regulation. Prereq. 44.515.

44.525 Health and Social Insurance I* (2 q.h.)

A study of the economic basis served by health and social programs of insurance, including a detailed analysis and comparison of the plans offered. (Offered Fall Quarter)

44.526 Health and Social Insurance II* (2 q.h.)

A continuing study of contracts, including benefit structure, rate-making, reserves and the proper use and coordination of the plans available from private industry and from the government. Prereq. 44.525. (Offered Winter Quarter)

44.527 Group Insurance and Pensions (2 q.h.)

The nature, development, and coverage offered by group life and health insurance. Analysis of the various kinds of individual and group pension plans and their use. (Offered Spring Quarter)

44.529 Advanced Property Insurance* (2 q.h.)

A study of the plans and programs designed to provide protection for multi-peril, diversified industrial, and commercial organizations. Prereq. 44.515. (Offered in Fall Quarter, 1975-1976)

44.530 Advanced Property-Casualty Insurance* (2 q.h.)

A study of the various plans and programs for providing liability and casualty protection for commercial and industrial organizations. Prereq. 44.515. (Offered Winter Quarter, 1975-1976)

44.543 Law of Insurance* (2 q.h.)

A study of the legal problems affecting insurance, including regulation design and interpretation of contracts and the relationship between the insurance company, its agent, and the public. Prereq. 45.543. (Offered Spring Quarter, 1975-1976)

45—MANAGEMENT

General Management

Consultant: Prof. D. McCarthy, College of Business 437-3256

Coordinator: J. L. Griffith 848-0835

Coordinator: W. A. Gagne 495-5455

45.501, 45.502, 45.503 Management and Organization I, II, III (6 q.h.)

An introduction to the American business system; comparison with other economic systems; principles and concepts of organization and management. Emphasis on topics such as the social responsibilities of business; business

*Upper level Business Administration course—see page 54.

and its environment; business ethics, etc. Traditional material presented toward an understanding of modern American business and preparation for a business career. The environment within which business operates; a review of the theory and practice of organization; the "what" and "how" of the management process; an application of the concepts covered to the functional areas of business. Prereq. 45.502, 45.503. (Offered every quarter) (Available on suburban campuses)

45.652 Management and Organization (Intensive) (6 q.h.)

Same as 45.501, 45.502, 45.503. Not open to students who have completed those courses. (Offered every quarter) (Available on suburban campuses)

45.523, 524, 525 Management Seminar I, II, III* (6 q.h.)

A broad interdisciplinary project utilizing one or more of the techniques of library research, field research, field surveys and organizational audits. Students will be expected to utilize the knowledge gained in earlier course work. Prereq. 45.535.

45.533, 534, 535 Management Decisions & Policies I, II, III (6 q.h.)

Takes the viewpoint of the general manager in planning effective relationships between the organization and its environment. Emphasis placed on sensing, analyzing, evaluating, and responding to demographic, cultural, political and technological change. Functions and responsibilities of top management; problems which affect the character and success of the total enterprise; operations in various environments and the impact of government regulations. A framework will be developed for dealing with a total organization evolving or modifying strategies and policy. Cases are drawn from profit oriented and non-profit entities of various sizes in widely diversified fields, operating in a variety of environments. Students will be expected to actively participate in class discussions of case studies. Prereq. minimum of 100 quarter hours of completed course work.

45.600, 45.601, 45.602 Small Business Management I, II, III (6 q.h.)

For those who wish to explore the opportunities of being in a small business or in business for themselves. Subjects considered include objective self-analysis; discovery of opportunities in the manufacturing, retailing and service fields; raising and conservation of capital; organization and site location factors; management controls in relation to legal, financial, personnel, and marketing problems.

45.603 Administrative Management & Office Services I (2 q.h.)

Principles and techniques of modern administrative management including organization, planning, office mechanization, computers, information requirements analysis, and the conducting of a systems study. (Offered Fall Quarter)

45.604 Administrative Management & Office Services II (2 q.h.)

An analysis of systems and procedures, business writing, report structuring, records management, control techniques, staffing, and methods of directing the administrative management function. Prereq. 45.504. (Offered Winter Quarter)

*Upper level Business Administration course—see page 54.

45.606 Management Decisions & Policies (Intensive)* (6 q.h.)

Same as 45.533, 45.534, 45.535, except presented twice per week during a single quarter. Prereq. Minimum of 100 Quarter Hours of completed course work. (Offered Summer Quarter)

45.646 Management Seminar (Intensive)* (6 q.h.)

Same as 45.523, 45.524, 45.525, except presented as a single quarter intensive course. Not open to students who have taken 45.523, 524, 525. Prereq. 45.535.

45.667 Project Planning and Control (2 q.h.)

This course employs a systems approach to planning and controlling a work project. Topics to be covered include detailed planning techniques, establishment of functional and individual responsibilities, resource allocation, identifying anticipated benefits, measuring results and effective progress reporting. Students will be expected to actively participate in class workshop sessions. Prereq. Minimum of 40 quarter hours of completed work. (Offered every quarter)

45.670 The Management of Change I (2 q.h.)

The firm as perceived in current terms is explored. Selected readings of significant dynamic management theorists are studied. Evaluation of business performance as related to dynamic company objectives; recognition of need for change; the exploration, development, and synthesis of the conceptual and practical implications of change dynamics; the dimensions of change—rate and direction—will be established; change as a management objective. Prereq. 45.503.

45.671 The Management of Change II (2 q.h.)

The transitional organization and the process of organizational change are studied; implications of technological advances on company operations; the firm and/or environment as causative change agents; establishment of planned, profit-oriented change strategies; the transitional manager innovative principles of administration and organization; the resistance to change; measurement and control of change dimensions. Case studies on the social, economic and political forces shaping society. Prereq. 45.670.

45.672 The Management of Change III (2 q.h.)

Conceptual approaches applied to the emerging organization are considered: administrative and organizational flexibility, strategy/structure synergism; integration of profit and social responsibility; industrial productivity and leisure time; interrelationship among economic, technological, social and political change and their impact on the firm; the systems manager; the development of a model for change. Prereq. 45.672.

45.696 Principles and Practice of Management (2 q.h.)

Considers management as a process engaged in various levels of any organization, and investigates fundamental principles which are generally accepted as the foundation of management action. Included among other topics are those of planning, organizational considerations, and directing and controlling an organization. Application of generally accepted principles are considered through investigation of management practice in organizational settings. (Offered every quarter)

*Upper level Business Administration course—see page 54.

49.504 Strategy for Planning I (3 q.h.)

Students participate as team members in a computerized decision-making exercise. Course materials, class discussions and guest lecturers will expose the student to planning techniques, systems, and issues with which executive management becomes involved. Each class member is provided with an opportunity to use a full range of skills and experience to make key decisions in planning and operating a company in an uncertain, competitive environment. Prereq. Minimum of 100 quarter hours of completed work. 45.535 recommended. (Offered Fall and Winter Quarters)

49.505 Strategy for Planning II (3 q.h.)

A continuation of 49.504. Students will have continued opportunities to analyze results of previous decision-making, engage in additional planning and decision-making, and conduct board meetings. Prereq. 49.504. (Offered Winter and Spring Quarters)

Industrial Management Courses

Consultant: J. M. Rosenfeld 969-4783

45.506 Production Management & Manufacturing Systems I (2 q.h.)

Analysis of the basic areas of production management, characteristic organizations, activities, responsibilities and decision making. The systems concept as applied to manufacturing. Manufacturing costs and their management.

45.507 Production Management & Manufacturing Systems II (2 q.h.)

Further analysis of the manufacturing system, including production control, materials, work design, simplification and measurement; quality control; data processing as applied to manufacturing; selected readings in modern production management techniques. Prereq. 45.506.

45.508 Production Management & Manufacturing Systems III (2 q.h.)

Continuing study and analysis of the manufacturing function; production and process technology; work place methods and standards; planning and control of operations and inventories: concepts, analytical techniques and information systems; selected case studies emphasizing relevant production management and manufacturing systems, concepts and applications. Prereq. 45.507.

45.519 Work Methods (2 q.h.)

The principles of motion economy and work simplification in analysis and improvement of methods, utilizing flow charts, diagrams, work station activity charts, and laboratory techniques. (Offered Fall Quarter)

45.526 Facilities Planning & Design I (2 q.h.)

The planning and designing of industrial plants, in terms of equipment and machinery requirements, plant layout and material flow, utilizing flow charting, scheduling, and laboratory scale models. Prereq. 45.508. (Offered Fall Quarter)

45.531 Facilities Planning & Design II (2 q.h.)

The fundamentals of material handling and related equipments, vehicles, and machinery, including cranes, conveyors, freight elevators, and monorails, with emphasis on analysis of problems, typical cases, and costs, and including engineering economy. Prereq. 45.526. (Offered Winter Quarter)

45.528 Work Measurement (2 q.h.)

Measurement techniques as applied to development of production and wage standard data, including appropriate incentive plans and directed towards quantity manufacturing, with laboratory use. (Offered Winter Quarter)

45.530 Standard Data Development (2 q.h.)

Development of production standards for job shop operations, applying curve, table, equation, nomograph, family and multivariables techniques, and utilizing work sampling methods and laboratory practice. (Offered Spring Quarter)

45.595 Manufacturing Seminar I* (2 q.h.)

Problems of manufacturing operation at the plant manager level, including production economics of specialization, simplification, standardization, diversification, expansion, contraction, or integration, all with pertinent, selected case studies. Prereq. 45.625 & 45.637.

45.596 Manufacturing Seminar II* (2 q.h.)

Continued analysis of manufacturing problems, including plant location, layout, materials handling, power maintenance, labor market status, organization and wage policy, all with pertinent, selected case studies. Prereq. 45.595

45.597 Manufacturing Seminar III* (2 q.h.)

Continued analysis of manufacturing problems, including controls of the manufacturing process; product design and development, scheduling, inventory, quality, cost and budgetary controls with applicable cases. Prereq. 45.596.

45.620 Industrial Safety (2 q.h.)

A study of the organization and administration of a comprehensive accident prevention program, including analysis of industrial hazards and accidents, corrective actions, and the responsibilities of all management echelons, from the safety engineer to top management. (Offered Fall and Spring Quarters)

45.623 Manufacturing Processes I—Material (2 q.h.)

Materials and their processing, including the derivation, characteristics, and applications of materials used in industry, such as ferrous, non-ferrous metals, plastics, their mechanical, thermal, electrical, chemical, and other properties with an analysis of applications to manufacturing.

45.624 Manufacturing Processes II—Production (2. q.h.)

Machinery, welding and allied processing, including an analysis of product design. Production processes and material selection in the production and manufacturing of hard goods, including selection of best methods by study of casting, machinery, forming, joining, hot and cold locking, extrusion, finishing, and assembly. Prereq. 45.623.

45.625 Manufacturing Processes III—Automation (2 q.h.)

The analysis of advanced manufacturing processes, including mass production, numeric control, central vs line layout systems, automated systems and related problems, computer controlled equipments and systems, equipment and machinery selection and replacement policies. Emphasis on manufacturing processes case studies. Prereq. 45.624.

*Upper level Business Administration course—see page 54.

45.627, 45.628 Value Management I, II (4 q.h.)

An organized technique for challenging costs by analyzing a product or method in terms of value, function, and costs, without sacrificing essential quality. (Offered Fall and Winter Quarters)

45.636 Production & Inventory Control I (2 q.h.)

Basic analysis and systems design techniques for controlling production. Aspects of intermittent and continuous production scheduling and the relationship of planning, scheduling and dispatching, and utilizing mathematical models. Scheduling techniques of PERT, CPM, line of balance and learning curves. Field trip to local company and examination of its production control system. (Offered Fall and Winter Quarters)

45.637 Production & Inventory Control II (2 q.h.)

Analysis and systems design techniques for controlling inventory levels emphasizing cost reduction, including inventory investment, economic order quantity, make or buy decisions, and warehousing. Goals include bringing the range of concept and technique to the point of useful application in practical design. Prereq. 45.636. (Offered Winter and Spring Quarters)

45.638 Industrial Decision Making I* (2 q.h.)

The development of a systematic approach to problem solving and decision making; decision theory; structure of human decisions. Prereq. 10.334.

45.639 Industrial Decision Making II* (2 q.h.)

Application of mathematical methods of management science and quantitative decision-making procedures to practical industrial problems; optimization and models applied to production functions such as the inventory process, plant location, layout and maintenance, and equipment selection, replacement, and maintenance. Prereq. 45.638.

45.640 Industrial Decision Making III* (2 q.h.)

Application of mathematical methods of management science and quantitative decision-making procedures to practical industrial problems, including linear systems utilizations and functional production applications such as: economic lot size, optimal machine loading, production, and employment scheduling; seasonal inventory distribution; transportation and transshipment models; maximum profit margin; methods improvements; selected case studies. Prereq. 45.639.

45.642 Production Management & Manufacturing Systems (Intensive) (6 q.h.)

Same as 45.506, 45.507, 45.508. Not open to students who have completed those courses. (Offered Fall, Spring, and Summer Quarters)

45.673 Industrial Processes I (2 q.h.)

Familiarizes the Industrial Technology student with the materials and processes used in manufacturing to convert ideas into products, machines and structures; characteristics and applications of materials used in industry; casting and forming processes; machining processes. Open to Industrial Technology students only. (Offered every quarter)

*Upper level Business Administration course—see page 54.

45.674 Industrial Processes II (2 q.h.)

Continued analysis of manufacturing processes including welding and allied processes; machine tools: advantages and limitations; economic analysis of manufacturing processes; automated and computer controlled systems; equipment and machinery selection and replacement policies. Prereq. 45.678. (Offered every quarter)

45.688 Production and Inventory Control (Intensive) (4 q.h.)

Same as 45.636, 45.637. Not open to students who have completed those courses. (Offered Fall, Spring, and Summer Quarters)

45.695 Materials Management (2 q.h.)

The development and examination of materials management objectives as they relate to cost improvement, investment control, and ability to serve the market; the development of an integrated market, the development of an integrated materials system; cases in materials management. (Offered every quarter)

49.501 Environmental Management I (2 q.h.)

The state of our environment now and in the future—an introduction to the types and threats of pollution, including the atmosphere, land, and waterways. Emphasis placed on impact of pollution upon economic growth, business profitability, governmental outlays and individual expenditures. Lectures, class participation, and selected readings. Written reports required.

49.502 Environmental Management II (2 q.h.)

A continuation of Environmental Pollution I in which the level of our technology is explored. A review of control techniques, disposal systems and purification equipment with an evaluation of their effectiveness and costs. Critical unsolved technical problems and the needs for scientific investigation will be highlighted. Lectures, class participation, and selected readings. Written reports required. Prereq. 49.501.

49.503 Environmental Management III (2 q.h.)

A continuation of Environmental Pollution II in which past, present and future controlling and corrective actions of business and government and the individual are examined. Evaluation of the balance between responsible self control and preventive legislation. Specific attention to the complexity of interacting factors and the dilemma of productivity demands versus the environmental limitations of adaptability. Lectures, class participation, and selected readings. Written reports required. Prereq. 49.502.

Purchasing

Coordinator: Mr. A. D. Finley 475-6172

45.537 Purchasing I (2 q.h.)

The fundamental mission and span of responsibility of industrial purchasing in business: the procurement cycle, its principles, methods, and vocabulary.

45.538 Purchasing II (2 q.h.)

Techniques of organization of the purchasing function: its systems, source selection and evaluation; the legal environment; quantity and quality determination. Prereq. 45.537.

45.539 Purchasing III (2 q.h.)

Techniques of creative buying: types of contracts; negotiating and price/cost analysis; purchasing ethics; supplier monitoring and expediting; contract modification and termination. Prereq. 45.538.

45.626 Professional Purchasing Techniques* (2 q.h.)

A seminar-type examination of methods of negotiation, use of contract types and incentives which yield improved buyer performance. Price analysis and the development of supplier monitoring and control techniques. Prereq. 45.539. (Offered Spring Quarter)

45.666 The Materials Acquisition Function (2 q.h.)

A survey of the procurement function as found in industry. This course is designed to furnish candidates, with majors in other than purchasing, a broad comprehension of the acquisition function. Purchasing's mission, procedures, proper interface with other functions, and its legitimate objectives are explored. System techniques, organizational structures and required skills are investigated and particular attention is given to the integration of this function into the total cycle of product creation. (Offered Fall and Spring Quarters)

Personnel & Industrial Relations

Coordinator: (Industrial Relations) Mr. D. F. Hurley 785-0484

45.517 Techniques of Employee Selection* (2 q.h.)

Recruitment, selection, and placement techniques including interviewing, employment testing, and examining. Prereq. 45.515. (Offered in Spring Quarter)

45.518 Wage and Salary Administration* (2 q.h.)

Wage and salary determination; merit and incentive plans; wage and salary structure; compensation methods; impact on employer-employee relations in the economy. Prereq. 39.503, 45.503. (Offered in Fall Quarter)

45.521 Employee Benefits* (2 q.h.)

Private and public programs directed to job and worker income security; unemployment compensation, training and employment services; private guaranteed income; retirement pension plans and disability; group insurance. Prereq. 39.503. (Offered in Winter Quarter)

45.522 Job Evaluation (2 q.h.)

Wage-payment systems; theory of wage determination, job elements, rating scales, writing job descriptions and specifications; selection of plans; development of wage structures and integration with the principles of merit rating. (Offered Fall Quarter)

45.545 Law Employment Standards* (2 q.h.)

The minimum wage laws—state and federal—and laws on employment practices, administrative and enforcement procedures, employment provisions of the 1964 Civil Rights Act, and of state anti-discrimination laws. Prereq. 45.611. (Offered in Fall Quarter)

*Upper level Business Administration course—see page 54.

45.546 Law of Employment Conditions* (2 q.h.)

The Labor Management Reporting and Disclosure Act, the Social Security Act, The Massachusetts Employment Security Act. The Massachusetts Workmen's Compensation Act, veterans' reemployment rights. Prereq. 45.611. (Offered in Winter Quarter)

45.548 Law of Labor Management Relations* (2 q.h.)

The legal framework for collective bargaining, the impact of the anti-trust laws on labor unions, injunctions in labor disputes, the Railway Labor Act, the National Labor Relations Act, the Labor-Management Relations Act. Prereq. 45.611. (Offered in Spring Quarter)

45.553 The Labor Agreement* (2 q.h.)

Labor contracts: component clauses, grievance analysis, and arbitration procedures. Case studies in labor-management relations affected by such clauses. Prereq. 45.611 (Offered Fall Quarter) (Available on suburban campuses 1974-1975)

45.556 Negotiations, Mediation, Arbitration* (2 q.h.)

The bargaining process; preparation and negotiation of agreements; mediation, fact-finding, arbitration, other alternatives to the strike. Prereq. 45.611. (Offered Winter Quarter) (Available on suburban campuses 1974-1975)

45.557 International Labor Movements* (2 q.h.)

Historical treatment of American labor union development and theories of labor organization; relation of labor and government, American, European, and Latin-American labor organization and institutions; international labor organizations. Prereq. 45.611 (Offered in Fall Quarter 1975-1976)

45.560 Seminar on Labor Issues* (2 q.h.) (For Seniors Only)

An advanced discussion of current labor-management issues; policy as to disputes, wage guidelines, public employees' unions, professionals, etc. Prereq. 45.546, 45.548, 45.553. (Offered Spring Quarter) (Available on suburban campuses 1974-1975)

45.610 Labor Management Relations I (2 q.h.)

The American labor movement and labor relations development; collective bargaining issues, policy and practice; public control of industrial relations. Prereq. 39.503. (Offered every quarter)

45.611 Labor Management Relations II (2 q.h.)

Continuation of I. The economic and political impact of bargaining power on labor markets, employment, wages, and income. Prereq. 45.610. (Offered every quarter)

45.690 Labor Management Relations (Intensive) (4 q.h.)

The American labor movement and labor relations development; collective bargaining issues, policy, and practice; public control of industrial relations. The economic and political impact of bargaining power on labor markets, employment, wages, and income. Prereq. 39.503. Not open to students who have taken 45.610, 45.611. (Offered Fall, Spring, and Summer Quarters) (Available on suburban campuses in Spring Quarter)

*Upper level Business Administration course—see page 54.

Personnel

45.511 Human Relations in Organizations I (2 q.h.)

An introduction to human problems of the work environment: motivation, employee participation; formal and informal organizations; and leadership patterns. (Offered every quarter)

45.512 Human Relations in Organizations II (2 q.h.)

A continuation of Human Relations I; the processes of communication, interviewing, counseling, appraisal of performance, and the accomplishment of change. Special employment groups and overview of the individual in his organization. Prereq. 45.511. (Offered every quarter)

45.513 Personnel Management I (2 q.h.)

Organization, function, and procedures of the personnel department in relationship to the management organization; manpower selection; training; rating; personnel policies, benefits, and reports.

45.514 Personnel Management II (2 q.h.)

Principles and techniques of training, the psychology of learning, meeting training needs, principles and practices of organizing training activities. Prereq. 45.513.

45.515 Personnel Management III (2 q.h.)

Controlling and coordinating the managerial responsibility of supervision; planning the work; employee assignments; employees attitudes; employee grievances; administering company policies, developing work interest. Prereq. 45.514.

45.552 Advanced Human Relations (2 q.h.)

A seminar to discuss the theories of human effectiveness. An amplification of topics surveyed in Human Relations I, II, emphasizing their practical application to present-day management of business enterprises. Review implications of such theories as the managerial grid, theory X, Y, maintenance vs motivation, etc. Prereq. 45.512. (Offered every quarter)

45.607 Personnel Management (Intensive) (6 q.h.)

Organization, function, and procedures of the personnel department in relationship to the management organization; manpower selection; training; rating; personnel policies, benefits, and reports. Principles and techniques of training; the psychology of learning; meeting training needs; principles and practices; organizing training activities. Controlling and coordinating the managerial responsibility of supervision; planning the work; employee assignments; employees' attitudes; employee grievances; administering company policies, developing work interest. Not open to students who have taken 45.513, 45.514, 45.515. (Offered Fall and Summer Quarters)

45.641 Human Relations in Organizations (Intensive) (4 q.h.)

An introduction to human problems of the work environment: motivation, employee participation, formal and informal organizations, and leadership patterns. The processes of communication: interviewing, counseling, appraisal of performance, and the accomplishment of change. Special employment groups and overview of the individual in his organization. Not open to students who have taken 45.511, 45.512. (Offered Winter, Spring, and Summer Quarters) (Available on Suburban Campuses in Spring Quarter)

45.691 Creative Problem-Solving (2 q.h.)

New ways of thinking are learned and practiced. Sensing and analyzing problems, producing ideas, evaluating and implementing solutions. The attitudes and climate conducive to creative thinking as well as common barriers will be presented. Provides methods for developing imagination which is the key part of the creative process. (Offered Fall and Spring Quarters)

Quality Control and Management Sciences

Consultant: Prof. R. A. Parsons, College of Business 437-3255

45.536 Principles of Material Inspection (2 q.h.)

An operating and technical-level course involving mensuration, need and function of inspection and specifications; basic principles and techniques of measurement; various methods and equipment used for gauging and measuring; special measuring and inspection problems. (Offered Fall Quarter)

45.561 Statistical Quality Control I (2 q.h.)

Description and practical application of the basic statistical quality-control methods for quality assurance, quality control and quality improvement of products and services; the determination of process capability; the use of quality control charts for measurable and non-measurable quality characteristics. Prereq. 39.513. (Offered Fall Quarter)

45.562 Statistical Quality Control II (2 q.h.)

Continuation of Statistical Quality Control I, covering the application of statistical and probability considerations in acceptance sampling of purchased material, work in process, and outgoing products. Methods of predicting sampling results using the hypergeometric, the binomial, and the poisson distributions; development of the operating characteristic curve for any sampling plan; risks involved in sampling and the concepts of AQL, RQL, AOQL. Prereq. 45.561. (Offered Winter Quarter)

45.563 Management of Quality Control (2 q.h.)

Modern concepts of managing the quality function of a company to maximize customer satisfaction at minimum quality cost; the idea of total quality control; measurement of the cost of quality; development of a co-ordinated program of improvement, organizing for diagnosis the defect causes. (Offered Spring Quarter)

45.565 Industrial Experimentation I* (2 q.h.)

Modern small sample techniques are applied to industrial problems. Use of statistical inference to make estimates and set confidence intervals of key characteristics of production lots and processes; design of single and multiple factor experiments; tests of significance; analysis of variance. Prereq. 39.513. (Offered Winter Quarter)

45.566 Industrial Experimentation II* (2 q.h.)

Tests of significance, analysis of variance; correlation techniques; experimental design; balancing and randomizing techniques; factorial designs; nested designs; Latin square; random balance/multiple-balance. Prereq. 45.565. (Offered Spring Quarter)

*Upper level Business Administration course—see page 54.

45.608 Quality Control and Management (Intensive) (6 q.h.)

Same as 45.561, 45.562, and 45.563. Not open to students who have taken these courses. Prereq. 39.513. (Offered Fall and Summer Quarters)

45.630 Introduction to Operations Research (2 q.h.)

Decision making under uncertainty integration of classical statistics and decision theory with Bayesian concepts; decision tree analysis; preference curves. (Offered Fall Quarter)

45.631 Operations Research Applications I (2 q.h.)

Mathematical programming; linear programming; graphical, vector, simplex, and transportation methods; the dual; degeneracy; integer programming; non-linear programming; dynamic programming. (Offered Winter Quarter)

45.632 Operations Research Applications II (2 q.h.)

Special topics including model building, queuing theory, simulation, Pert-CPM, and game theory. (Offered Spring Quarter)

45.633 Advanced Quality Control I* (2 q.h.)

Detailed study of specialized techniques used in defect-cause diagnosis and problem analysis. Complete analysis of process capability; the multi-vari chart; pictograms the span plan method. Prereq. 45.562. (Offered Fall Quarter, 1975-1976)

45.634 Advanced Quality Control II* (2 q.h.)

Continuation of Advanced Quality Control I with special emphasis on design of control plans for process quality control and special cases of product acceptance. Prereq. 45.624. (Offered Winter Quarter, 1975-1976)

45.692 Quality Control I, II (Intensive) (4 q.h.)

Description and practical application of the basic statistical quality-control methods for quality assurance, quality, control, and quality improvement of products and services the determination of process capability; the use of quality control charts for measurable and non-measurable quality characteristics. The application of statistical and probability considerations in acceptance sampling of purchased material, work in process, and outgoing products. Methods of predicting sampling results using the hypergeometric, the binomial, and the poisson distributions; development of the operating characteristic curve for any sampling plan; risks involved in sampling and the concepts of AQL, RQL, AOQL. Not open to students who have taken 45.561, 45.562. Prereq. 39.513. (Offered in Winter Quarter)

Law

Consultant: Mr. H. Olins, Esq. 482-6998

45.541 Law I* (2 q.h.)

CONTRACTS: Nature, kinds, and formation of contracts; essential elements; interpretation of contracts.

*Upper level Business Administration course—see page 54.

45.542 Law II* (2 q.h.)

AGENCY: Nature, formation, and termination of agency relationships; rights and duties of principal and agent; scope of agent's authority.

SALES: Nature of sales contracts; warranties; transfer of title; rights and remedies of seller and buyer. *Prereq. 45.541.*

45.543 Law III* (2 q.h.)

NEGOTIABLE INSTRUMENTS: Bills, notes and checks; liabilities and defenses of parties; procedure upon dishonor; discharge.

BUSINESS ORGANIZATIONS: Survey of corporations and partnerships. *Prereq. 45.542.*

45.643 Law (Intensive)* (6 q.h.)

CONTRACTS: Nature, kinds, and formation of contracts; essential elements; interpretation of contracts.

AGENCY: Nature, formation, and termination of agency relationships; rights and duties of principal and agent; scope of agent's authority.

SALES: Nature of sales contracts warranties; transfer of title; rights and remedies of seller and buyer.

NEGOTIABLE INSTRUMENTS: Bills, notes, and checks; liabilities and defenses of parties; procedure upon dishonor; discharge.

BUSINESS ORGANIZATIONS: Survey of corporations and partnerships. Not open to students who have taken 45.541, 45.542, 45.543. (Offered Fall and Summer Quarters)

45.693 Law and Social Issues (2 q.h.)

A study of the structure and dynamics of the American Legal System approached through an analysis of selected cases dealing with social issues. (Offered every quarter)

Management Information Systems

Consultant: Mr. T. J. McNamara 479-4949

Coordinator: (EDP) Mr. R. M. Morrison 742-4000

45.570 Electronic Data Processing I (2 q.h.)

An introduction to computers including the discussion of numbering and coding systems; examples of typical business problems; and study of basic programming concepts. (Offered every quarter)

45.571 Electronic Data Processing II (2 q.h.)

A survey of available computer systems; price and performance comparison of available input, output, and storage media; discussion of filing and sorting techniques; and presentation of COBOL and other programming languages. *Prereq. 45.570.* (Offered every quarter)

45.572 Electronic Data Processing III (2 q.h.)

A presentation of data communications concepts and terminals; discussion of business data processing and operations research applications; and a summary of trends in EDP. *Prereq. 45.571.* (Offered every quarter)

*Upper level Business Administration course—see page 54.

45.648 Electronic Data Processing (Intensive) (6 q.h.)

An introduction to computers including the discussion of numbering and coding systems; examples of typical business problems; and study of basic programming concepts. A survey of available computer systems; price and performance comparison of available input, output, and storage media; discussion of filing and sorting techniques; and presentation of data communications concepts and terminals. A presentation of COBOL and other programming languages; discussion of business data processing and operations research applications; and a summary of trends in EDP. Not open to students who have taken 45.570, 45.571, 45.572. (Offered Fall, Spring and Summer Quarters) (Available on suburban campuses)

45.675, 45.676 Electronic Data Processing (A), (B) (6 q.h.)

An introduction to computers including the discussion of numbering and coding systems; examples to typical business problems; and study of basic programming concepts. A survey of available computer systems; price and performance comparison of available input, output, and storage media; discussion of filing and sorting techniques; and presentation of data communications concepts and terminals. A presentation of COBOL and other programming languages; discussion of business data processing and operations research applications, and a summary of trends in EDP.

Coordinator: (Programming) Mr. J. G. Sullivan 443-3122

45.599 Basic Computer Programming (2 q.h.)

A one quarter survey course in introductory computer programming for business students. Fundamentals of programming are introduced along with COBOL, Common Business Oriented Language. The divisions of COBOL, Data File Structure, verb actions are studied. Each student will prepare and check out programs using the University Computer Center. Prereq. 45.572. (Offered every quarter)

45.573 Computer Programming for Business I (2 q.h.)

Fundamentals of business application programming: Introduction to COBOL, Common Business Oriented Language, adopted as standard business programming language of EDP industry. Principles of flowcharting. Programs prepared by student are run and checked out using University's Computation Center computer. Prereq. 45.572. (Offered Fall and Winter Quarters)

45.574 Computer Programming for Business II (2 q.h.)

Programming in COBOL presented in more detail. Business data processing functions of editing, file updating, report writing are illustrated and implemented in programs prepared by students and run on University's computer. Programming involves punched card input and line printer output. Prereq. 45.573. (Offered Winter and Spring Quarters)

45.575 Computer Programming for Business III (2 q.h.)

More sophisticated programming techniques as applied to the solution of more complex business application problems. Random access disk file organization and processing is illustrated. Disk and magnetic tape files are utilized in problem solving. Prereq. 45.574. (Offered Spring and Summer Quarters)

*Upper level Business Administration course—see page 54.

45.617 Advanced Computer Programming I* (2 q.h.)

Introduction to assembler language programming using the University's computing system. Organization, representation, and processing data within the computer. Looping, instruction modification, indexing, indirect addressing and data retrieval are introduced. Cursory survey of assembler languages in general. Prereq. Demonstrate familiarity with any currently available computer language.

45.618 Advanced Computer Programming II* (2 q.h.)

Further exploration of assembler language techniques, other addressing structures, floating point techniques, coding and use of macro instructions. Input-output routines, use of operating system for job scheduling, resource allocation, file handling. Business problems analyzed, flowcharted, programmed and debugged on University's computer by students. Debugging of problems by core dump analysis. Preq. 45.617.

45.619 Advanced Computer Programming III* (2 q.h.)

Utilization of business data processing hardware on University's computing system. Further use of operating system, divide independent file handling. Blocked and unblocked file manipulation. Application of assembler language to a sophisticated programming project. Prereq. 45.618.

45.644 Computer Programming for Business (Intensive) (6 q.h.)

Fundamentals of business application programming: Introduction to COBOL, Common Business Oriented Language, adopted as standard business programming language of EDP industry. Principles of flowcharting. Programs prepared by students are run and checked out using the University's Computation Center computer. Programming in COBOL presented in more detail. Business data processing functions of editing, file updating, report writing are illustrated and implemented in programs prepared by students and run on the University's computer. Programming involving punched card input and line printer output. Prereq. 45.527. Not open to students who have taken 45.573, 45.574, 45.575. (Offered Winter and Summer Quarters)

45.677 Operating Systems I (2 q.h.)

Survey type course—describing operating systems and investigating the full range of systems services available under computer operating systems. Special emphasis is placed on their value as tools for developing management information. (Note: This quarter could stand alone as management tool for decision-making.) Prereq. 45.575.

45.678 Operating Systems II (2 q.h.)

Specific software covered will be systems supervisor, data management system, FORTRAN, COBOL, PL/1, and special purpose compilers. Also investigated will be operating systems which accommodate network analysis, Pert systems, simulation packages, and statistical analysis packages. Prereq. 45.677.

45.679 Operating Systems III (2 q.h.)

Detail analysis on data management systems with specific case studies and development of operating system programs. Prereq. 45.678.

*Upper level Business Administration course—see page 54.

45.680 Computer-Communications Systems Design and Analysis I (2 q.h.)

Discussion of computer-communications with emphasis on types of devices, communication lines; economic considerations such as line charges, types of lines, etc.—study of design and development considerations involved in a communications program—study of time-sharing programs and how they relate to communications programming. Prereq. 45.575.

45.681 Computer-Communications Systems Design and Analysis II (2 q.h.)

Discussion of types of communication programs such as information retrieval, message switching, data reception and transmission, and others. Buffering techniques for communications programs. Prereq. 45.680.

45.682 Computer-Communications Systems Design and Analysis III (2 q.h.)

Case studies in the design and development of several types of computer-communications programs. The student will develop flowcharts, systems definition system and program narratives, and documentation of programs pertinent to case studies. Student will check out communications programs under simulation. Prereq. 45.681.

45.684 RPG Programming (2 q.h.)

Provides a working knowledge of the Report Program Generation language. This language is suited to small scale computer usage for such tasks as: Report Generation; file up-dating; various utility functions. Students will write and debug class problems. (Offered Fall and Spring Quarters)

45.685 Computer Programming for Scientific Applications I* (2 q.h.)

Designed to provide the student with a working knowledge of FORTRAN, the modern problem oriented computer language. Enables the professional to understand the use of a computer in solving problems in business, mathematics, and the social and physical sciences by introducing him to problems in selected applications, and illustrating use of FORTRAN in finding solutions. Prereq. 45.572. (Offered Fall Quarter)

45.686 Computer Programming for Scientific Applications II* (2 q.h.)

The course provides the student with practical experience in the use of FORTRAN in solving significant problems in business, mathematics, and the social and physical sciences. Problems of sufficient complexity will be used to allow the student to actively participate in the various steps necessary to analyze, define, document, and solve the problem using FORTRAN. Prereq. 45.685. (Offered Winter Quarter)

45.687 Computer Programming for Scientific Applications III* (2 q.h.)

A sophisticated set of problems are presented to teams of students for solution. Consultations with instructor allows students to actively participate in solving problems with the use of FORTRAN. Prereq. 45.686. (Offered Spring Quarter)

Coordinator: (Systems) Mr. R. E. Anderson 862-6831

45.577 Data Systems Administration (2 q.h.)

The major phases involved in the study and detailed planning for the effective use of data processing equipment and management sciences in meeting the information needs of business are presented, including the analysis of company objectives, the feasibility study, the system specifications, equipment selection, and the implementation of the new system. Prereq. 45.572 (Offered in Fall and Summer Quarter) (Available on suburban campuses)

*Upper level Business Administration course—see page 54.

45.578 Business Data Processing Applications I (2 q.h.)

Each student is given an opportunity to understand and perceive a company as a total operating system. Specific systems applications examined include inventory control, purchasing, accounts payable, and their integration. Specific techniques on data collection including data communications are dealt with during the quarter. A field trip to a communications training center and a team case study project complete the quarter. Prereq. 45.577. (Offered Winter Quarter) (Available on suburban campuses)

45.579 Business Data Processing Applications II (2 q.h.)

A continuation of 45.578 covering additional information systems of accounts receivable, sales analysis, the design of integrated systems, a review of "on-line" systems and computer system simulation. The opportunity to participate in a computer simulation exercise is offered during a field trip. A team case study project completes the quarter. Prereq. 45.578. (Offered Spring Quarter) (Available on suburban campuses)

45.586 System Design and Techniques I (2 q.h.)

Introduction to system concepts, system department organization, forms design, systems controls, and manuals. Prereq. 45.503 or 45.572. (Available on suburban campuses)

45.587 System Design and Techniques II (2 q.h.)

Development of system techniques through lectures and case studies, including work simplification, work measurement, flow charting, system cost estimating, and system development. Prereq. 45.586.

45.588 System Design and Techniques III (2 q.h.)

Application of system techniques through extensive use of case studies covering the full spectrum of system development and design. Prereq. 45.587.

45.589 Advanced Business System Design I* (2 q.h.)

Introduction to total computer based system concepts, resource management, functional data flows, information feedback process, and major design criteria. Prereq. 45.588. (Available on suburban campuses)

45.590 Advanced Business System Design II* (2 q.h.)

Detailed analysis of a manufacturing company's business system design, focusing on data base design and subsystem relationships between order entry, production control, and inventory control. Prereq. 45.589.

45.591 Advanced Business System Design III* (2 q.h.)

Management information system design, including the impact of advanced capabilities such as data communication, on-line file storage, and simulation on the design and system approach. Prereq. 45.590.

45.592 Advanced Computer System Techniques I* (2 q.h.)

On-line data communication systems covering the range of services available, remote input and output devices, techniques of control, and application examples. Prereq. 45.591. (Available on suburban campuses)

*Upper level Business Administration course—see page 54.

I5.593 Advanced Computer System Techniques II* (2 q.h.)

On-line mass storage devices, data base design, and file retrieval techniques. Real-time input-output techniques including visual and graphic displays. Prereq. 45.592.

I5.594 Advanced Computer System Techniques III* (2 q.h.)

Time sharing system concepts, design, and languages. Application of on-line and time sharing system techniques through case studies and field trips. Prereq. 45.593.

I5.616 Government Data Processing Applications I (2 q.h.)

Discusses the basic role of data processing in the current governmental activities in education (including computer assisted instruction), health (including patient care), welfare (including urban planning), information (including graphic storage and retrieval systems) through description of scientific advanced systems and equipment. Prereq. 45.572. (Available as Fall Quarter intensive)

I5.653 Government Data Processing Applications II (2 q.h.)

Describes principal applications and specific advanced system designs and equipment which have been employed successfully by various levels of government in the fields of public administration, planning, finance, law enforcement and judicature, communication, and integrated information bases. Prereq. 45.616.

I5.655 Auditing Data Processing Applications I (2 q.h.)

A general presentation of auditing techniques used when auditing typical electronic data processing installations. Functional assignment of duties within an electronic data processing installation. Control over input and output, and over data processing. Methodology of safeguarding record files, both physical and against unauthorized use. Prereq. 45.572. (Available as Fall and Spring Quarter intensive)

I5.656 Auditing Data Processing Applications II (2 q.h.)

A continuation of auditing applications when reviewed for internal control, hardware checks, system checks, and audit trail. Auditing around the computer versus through the computer. Using the computer to test the Data Processing system and also the records produced by the computer system. Auditing advanced Data Processing systems. Prereq. 45.655.

I5.658 Retail Marketing & Distribution Data Processing Applications I (2 q.h.)

Analyzes the unique characteristics of the retail application including high volume of transactions, low unit value, decentralized input, short term employees, multi-level reporting and their effects on the EDP systems requirements in each of the classical areas of the organization. Prereq. 45.572. (Available as Fall Quarter intensive)

I5.659 Retail Marketing & Distribution Data Processing Applications II (2 q.h.)

Develops the systems considerations of the first quarter further into the requirements of an overall, integrated management information system for retail. Prereq. 45.658.

*Upper level Business Administration course—see page 54.

45.661 Banking Data Processing Applications I (2 q.h.)

Reviews the major functions of banking, deposit loan and money, and analyzes their uniqueness from an EDP point of view in the applications of demand deposit accounting, commercial, and installment loan accounting, bank credit card accounting, and credit file maintenance. Prereq. 45.572. (Available as Fall Quarter intensive)

45.662. Banking Data Processing Applications II (2 q.h.)

Expands on first quarter by analyzing mortgage accounting, savings accounting, mutual fund and stock transfer accounting, personal trust accounting, new remote terminals and the development of management information systems for commercial banks and thrift institutions. Prereq. 45.661.

45.664 EDP in Property and Casualty Insurance I (2 q.h.)

A survey of the various functions unique to property and casualty industry and the role of data processing as applied to the particular functions: underwriting, policy production claims, and actuarial. Prereq. 45.572.

45.665 EDP in Property and Casualty Insurance II (2 q.h.)

Application of the principles surveyed in the first quarter to one or more case studies developing an information system for property and casualty company management. Prereq. 45.664.

45.668 Peripheral Systems Techniques I (2 q.h.)

This course deals with the many peripheral skills and techniques which the modern analyst must employ in his daily activities. Specific areas to be covered include the systems approach to decision-making, interviewing, preparing and presenting proposals to executive management, techniques of documentation. Prereq. 45.573. (Offered Winter Quarter)

45.669 Peripheral Systems Techniques II (2 q.h.)

A continuation of 45.668. This course will cover such topics as the impact of the systems analyst as a trainer; organizational employers of third generation computers; control and systems auditing, and the establishment of data processing standards. Prereq. 45.668. (Offered Spring Quarter)

45.694 Systems Design & Techniques (Intensive) (6 q.h.)

Introduction to system concepts, system department organization, forms design, systems controls, and manuals. Development of system techniques through lectures and case studies, including work simplification, work measurement, flow charting, system cost estimating, and system development. Application of system techniques through extensive use of case studies covering the full spectrum of development and design. Not open to students who have taken 45.586, 45.587, 45.588. Prereq. 45.503 or 45.572. (Offered Spring and Summer Quarters)

45.697 Information Processing In Medicine I (2 q.h.)

A non-technical survey of the impact and potential of computers in medicine: medical records; clinical reporting systems; automated laboratories; on-line monitoring; research needs; medical administration requirements. Prereq. none. (Offered Fall Quarter)

5.698 Information Processing in Medicine II (2 q.h.)

analysis of the content and interactions of medical information sub-systems. Applications of computerization of various medical activities; equipment selection; organizational considerations. Prereq. 45.697. (Offered Winter Quarter)

47—REAL ESTATE

consultant: Mr. G. D. Prigmore 536-2474

7.501 Real Estate Fundamentals I (2 q.h.)

An introduction to the fundamentals of real estate including basic terminology and various types of purchase contracts. Real estate brokerage and leasing fundamentals in commercial, office, and residential properties will also be explored. (Offered Fall, Winter, and Spring Quarters) (Available on suburban campuses)

7.502 Real Estate Fundamentals II (2 q.h.)

A general examination of real property management with emphasis on the special characteristics of different types of property, along with introduction to valuation of property, including analysis of operating statements. Prereq. 7.501 or permission of instructor. (Offered Winter, Spring, and Summer quarters)

7.503 Real Estate Fundamentals III (2 q.h.)

Real Estate financing will be explored with respect to the various types of institutions involved in the financing of different properties, including interim, permanent, and secondary financing. Specific case studies will also be used. Prereq. 47.502 or permission of instructor. (Offered Spring, Summer, and Fall quarters)

7.504 Real Estate Fundamentals (Intensive) (6 q.h.)

Same as 57.501, 502 and 503. Not open to students who have taken those courses. (Offered Summer Quarter)

7.508 Real Estate Financial Analysis I (2 q.h.)

Structure and analysis of real estate income and expense statements. Sources of funds, borrowing methods, effects of taxation, rates of return, etc. Prereq. 7.503 or permission of instructor. (Offered Fall Quarter) (Available on suburban campuses)

7.509 Real Estate Financial Analysis II (2 q.h.)

Analysis of risks and problems involved in financing real property with emphasis on use of case studies and problems. Class participation stressed. Prereq. 47.508, or permission of instructor. (Offered Winter Quarter)

47.511 Fundamental Real Estate Appraisal (2 q.h.)

A fundamental course in real estate appraisal with emphasis on single- and two- and three-family properties. Analysis of city and neighborhood influences, site valuation, building diagnosis, depreciation, study of the applicable approaches to value, appraisal report preparation. Prereq. 47.503 or permission of instructor. (Offered Fall Quarter) (Available on suburban campuses)

47.512, 47.513 Advanced Real Estate Appraisal I & II (4 q.h.)

An advanced course in the evaluation of residential and income properties. Application of the cost, market, and income approaches to apartment buildings and commercial and industrial developments. Particular emphasis on the various methods of capitalization and residual techniques. Class participation in case studies and problems. Prereq. 47.511, 47.512, or permission of instructor. (Offered Winter and Spring Quarters) (Available on suburban campuses)

47.521 Real Estate Development (2 q.h.)

Analysis of the problems in real estate development using the case method. Emphasis on the risks and opportunities which face developers in the planning, marketing, construction, and financing of apartments, shopping centers, and office buildings. Prereq. 47.509 or permission of instructor. (Offered Spring Quarter)

47.527 Housing (2 q.h.)

A specialized course dealing with the demand for housing and the ability of the private market to meet the demand. Particular emphasis placed on public programs dealing with housing via the private sector. Prereq. 47.509 or permission of Instructor. (Offered Spring Quarter)

47.524 Private Real Estate Law (2 q.h.)

Elements of a real estate contract and its enforceability; the concept of title; mortgages and their purposes; recording of real estate interests; the landlord and tenant relationship. Prereq. 47.503 or permission of instructor. (Offered Fall Quarter)

47.525, 47.526 Public Real Estate Law I & II (4 q.h.)

This course will focus on zoning, subdivision control, conservation controls, taxation of real estate, rent control, eminent domain, and urban renewal. Prereq. 47.503, 47.525, or permission of instructor. (Offered Winter and Spring Quarters)

47.528, 47.529, 47.530 Real Estate Management I, II, III (6 q.h.)

A course designed to prepare the student with the practical problems of real estate management. The course stresses the requisite day-to-day management of commercial, industrial, and residential properties as well as the need for a management strategy as it relates to long-term property value. Prereq. none.

48—TRANSPORTATION & PHYSICAL DISTRIBUTION MANAGEMENT

Consultant: Dr. R. C. Lieb, College of Business 437-3236

48.514 Elements of Transportation and Distribution I (2 q.h.)

An introduction to regulatory, economic, and management aspects of transportation from the viewpoints of shippers, government, and carrier managers. Topics include: costs, rates, operations, entry, mergers, intercity passenger and urban transportation. A course of general interest to students of business, law or government. Prereq. for all other courses in transportation. (Not open to students who have completed course numbers 48.501, 48.502, 48.503.) (Available on suburban campuses)

48.515 Elements of Transportation and Distribution II (2 q.h.)

An introduction to physical distribution management concepts. Topics include marketing, locational strategy, organization, inventory control, forecasting, and cost control. Course uses text and case materials developed from industry situations. Prereq. 48.514. (Not open to students who have completed course numbers 48.501, 48.502, 48.503.)

48.516 Elements of Transportation and Distribution III (2 q.h.)

Continued examination of the major elements of the physical distribution mix. Topics include: information flow, data processing, warehousing, and labor relations. Cases include application of the "total cost" approach to physical distribution. Prereq. 48.514. (Not open to students who have completed course numbers 48.501, 48.502, 48.503.)

48.504 Transportation Regulation and Promotion I (2 q.h.)

Study of the history and content of the Interstate Commerce Act. Prereq. 48.527, 48.514, or former course numbers 48.503 and 48.526.

48.505 Transportation Regulation and Promotion II (2 q.h.)

Examination of administrative law and procedure, the code of ethics and the general rules of practice. Prereq. 48.504.

48.506 Transportation Regulation and Promotion III (2 q.h.)

Analysis of cases pertinent to the Commerce Clause. Preparation for ICC Practitioners Exam. Prereq. 48.505.

48.527 Traffic Management I—Rates and Tariffs (2 q.h.)

A practical course in the interpretation and use of tariffs. Topics include classifications, rate scales, tariff rules, rate making procedures, etc. Prereq. 48.514 or former course numbers 48.501, 48.502, 48.503. (Not open to students who have taken former course numbers 48.524, 48.525, 48.526.)

48.528 Traffic Management II—Rates and Tariffs (2 q.h.)

An advanced course in the interpretation and use of tariffs. Topics include ICC law and practice, and computerized tariffs. Prereq. 48.527. (Not open to students who have taken former course numbers 48.524, 48.525, 48.526.)

48.529 Traffic Management III—Selected Topics (2 q.h.)

A practical course in traffic management covering topics other than rates and tariffs. Subjects include: routing, claims, insurance, consolidation, packaging, etc. Course uses cases and text. Prereq. 48.514 or former course numbers 48.501, 48.502, 48.503. (Not open to students who have taken former course numbers 48.524, 48.525, 48.526.)

48.534 Surface Transportation I—Railroad Management (2 q.h.)

A management-oriented course that considers the current and future status of the railroads. Topics include: investment and finance, mergers, marketing, labor relations, operations and control, diversification, and public policy. Prereq. 48.514 or former course numbers 48.501, 48.502, 48.503. (Replaces former course number 48.511 and 48.512.) (Offered Fall Quarter)

48.535 Surface Transportation II—Motor Carrier Management (2 q.h.)

A management-oriented course that considers the current and future status of the regulated motor-carrier industry. Topics include: equipment selection and finance, mergers, marketing, labor relations, routes, operations and control, and public policy. Prereq. 48.514 or former course numbers 48.501, 48.502, 48.503. (Replaces former course numbers 48.517, 48.518.) (Offered Winter Quarter)

48.536 Surface Transportation III—Marine Transportation Management (2 q.h.)

A management-oriented course that considers the current and future status of the U.S. Merchant Marine. Topics include: international trade patterns, government promotion and subsidy, technological innovations, port facilities, and labor relations. Prereq. 48.514 or former course numbers 48.501, 48.502, 48.503. (Replaces former course number 48.513.) (Offered Spring Quarter)

48.537 Surface Transportation IV—Private Trucking Management (2 q.h.)

Initiating a private trucking operation. Topics include legality, purchase vs. lease of equipment, operations, and measures of performance. Prereq. 48.514 or former course numbers 48.501, 48.502, 48.503. (Replaces former course number 48.519.) (Offered Spring Quarter)

48.538 Management of Warehouse Operations (2 q.h.)

A practical course in the management of warehouses. Topics include: site selection, construction, finance, operations, measurement of performance, and warehouse technology. Prereq. 48.514, 48.515, 48.516 (Replaces former course number 48.521.) (Offered Fall Quarter, 1974–1975)

48.539 Organization and Control of Physical Distribution Management (2 q.h.)

Establishment of a physical distribution organization. Measuring performance. Interrelationships with other functions in the company. Interpersonal relations. Prereq. 48.514, 48.515, 48.516 (Replaces former course number 48.522). (Offered Winter Quarter, 1974–1975)

48.540 Management Science and Physical Distribution Management (2 q.h.)

Application of quantitative techniques to physical-distribution management, including: linear programming, simulation, and statistical decision theory. Students will use computer facilities for solving problems. Knowledge of programming is not required. Prereq. 48.514, 48.515, 48.516 or 10.539 (math), or its equivalent. (Replaces former course number 48.523.) (Not offered 1974–1975)

48.541 Air Transportation Management I (2 q.h.)

Economics and regulation of Civil Aeronautics Board certified commercial passenger aviation—including routes, schedules, operations, pricing, mergers, cost analysis, and financing. Case method of instruction emphasized. Prereq. 48.514. (Offered Burlington Campus only)

48.542 Air Transportation Management II (2 q.h.)

Similar topics as 48.541, but for cargo operations. Prereq. 48.541.

48.543 Air Transportation Management III (2 q.h.)

Economics and regulation of general aviation including analysis of corporate, air taxi, and third level operations. Prereq. 48.542.

48.547 Urban Transportation I (2 q.h.)

The planning and financing of urban transportation systems. Role of federal, state, and local governments. Choice of technology and method of financing. The concept of "balanced" transportation. Prereq. 48.514 (Replaces former course number 48.544.) (Offered Fall Quarter, 1975-1976)

48.548 Urban Transportation II (2 q.h.)

Management of urban transportation systems. Topics include: routes and services, pricing, labor relations, selection of equipment, community relations, and measures of performance. Prereq. 48.547. (Replaces former course numbers 48.545, 48.546.) (Offered Winter Quarter, 1975-1976)

48.549 Seminar in Selected Transportation and Physical Distribution Management Topics

A seminar which focuses on a topic of particular interest during the academic year, for example, reappraisal and formulation of National Transportation Policy, labor relations in transportation, ecology and transportation, etc. The seminar will utilize speakers and published materials and will require a written or oral presentation by the students at the end of the course. The seminar topic will be announced during the academic year in time for registration for the Spring term. Prereq. 48.514. (Offered Spring Quarter, 1974-1975)

48.600 Seminar in Northeast Corridor Transportation (2 q.h.)

Analysis of the demand for and supply of passenger and freight transportation in the Northeast Corridor. Topics include: government policy, technology, carrier strategy, the consumer, and interrelationships between transportation and economic activity. Students make a presentation of their research findings at the end of the course. This course should be of interest to students of business, government, engineering, economics, and planning. Prereq. 48.514 and 10.539 (math), or its equivalent. (Offered Spring Quarter, 1975-1976)

50—EDUCATION FOUNDATIONS**50.111 Social Science I (3 cl., 3 q.h.)**

Cultural anthropology and education. Theories and concepts in cultural anthropology will be studied with primary emphasis on their relevance to informal and formal aspects of educational processes. Considerable attention will be devoted to the study of cross cultural materials in order to understand the educational process in different cultural milieus.

50.112 Social Sciences II (3 cl., 3 q.h.)

Sociology and education. Involves sociological analysis of the educational enterprise in the United States and other technologically advanced societies, including consideration of the socialization process, the formation of youth cultures, and the function of the schools in these contexts. Attention will be given to the study of the effects of stratification, ethnic, and racial factors on educational institutions, education and social change, and the school as a social system.

50.113 Social Science III (3 cl., 3 q.h.)

Intergroup relations and education. Examination of theoretical and empirical materials relative to the problem of intergroup relations and prejudice. Particular attention will be paid to the role of education in the reduction of intergroup conflict.

50.121 Human Development and Learning I (4 cl., 4 q.h.)

Developmental processes from prenatal life up to adolescence, theories of learning and personality, with research and case material covering major aspects of psychological development.

50.131 Human Development and Learning II (4 cl., 4 q.h.)

Continuation of Human Development and Learning I. Significant aspects of adolescence—physical, social, and psychological factors as they influence adolescent behavior. Prereq. 50.121.

50.141 Measurement and Evaluation (4 cl., 4 q.h.)

The fundamentals of measurement; basic statistical concepts and techniques used; evaluation of standardized and teacher-made tests. Prereq. Meth. and Mat. course in maj. field.

50.151 Backgrounds of American Education (4 cl., 4 q.h.)

Historical and philosophical foundations of American education beginning with old-world origins; development of American schools and educational thought from the colonial period to the present with emphasis on major current issues in education. Prereq. 50.141.

51—EDUCATION — INSTRUCTION

51.135 Analysis of Teaching and Educational Process (4 cl., 4 q.h.)

The relationships that exist between instructional objectives and teaching behavior; applications of human development and learning concepts as they relate to subsequent specialized teaching methods and materials. Research results and promising theory are used to extend the prospective teacher's concepts of the teaching function. Prereq. 50.131.

51.143 Methods and Materials of Teaching English (4 cl., 4 q.h.)

An introduction to the structure and functions of language as they apply to the teaching of English; curriculum and planning in English; the unit approach; specific techniques of teaching reading and literature, grammar and usage, written and oral composition, listening, spelling, vocabulary, and the use of mass media. Prereq. 51.135.

51.151 Student Teaching with Related Seminar (8 q.h.)

A University-arranged practicum of observation and teaching in schools within reasonable commuting distance of Northeastern. Participating on a full-time basis, the student is expected to develop planning and communication abilities within his major field. Biweekly seminars at the University provide additional opportunity to analyze theory-practice relationships and to examine generic problems of teaching. Prereq. Permission of adviser.

54—EDUCATION — READING

54.126 Teaching Reading in Secondary Schools (4 cl., 4 q.h.)

For English and social studies majors in the College of Education who are preparing for teaching in the junior or senior high schools. Basically the same approach and organization applies to this course as to the elementary level course.

63—THERAPEUTIC RECREATION SERVICES

63.501 Introduction to Therapeutic Recreation Services (2 q.h.)

Philosophy and scope of modern recreation and its role in society.

63.510 Philosophy of Recreation and Leisure (2 q.h.)

Goals for American recreation studied in modern context; implications for the professional; historical background, concepts of work, leisure, recreation; trends, issues, and future direction.

63.521 Recreational Skills I (Social Recreation) (2 q.h.)

Techniques of leadership, planning, and motivation for social-recreation activities; mixers, table games, active and inactive group games, adapting and creating games.

63.522 Recreation Skills II (Music Therapy) (2 q.h.)

Theory and practical application of music activities in special therapeutic settings.

63.523 Recreation Skills III (Guitar or Auto Harp) (2 q.h.)

An introductory course in tablature reading; designed to develop personal skills for accompaniment of group singing.

63.531 Techniques of Recreation Leadership (2 q.h.)

Study and practical experience in a diversity of group programs and processes.

63.532 Interagency Planning for Community Action (2 q.h.)

A study of agencies and how they function (program and personnel); how agencies cooperate for interagency programming. Legal and financial aspects and their effect on the program.

63.535 Recreation Skills VI (Special Events and Programs) (2 q.h.)

How to organize and administrate tournaments for selected activities; checkers, chess, card games, table games, party planning, and techniques.

63.547 Outdoor Education for Handicapped (2 q.h.)

Technical training and experiences for adapted recreation and education for exceptional and handicapped age groups.

63.549 The Process of Aging (2 q.h.)

The experience and viewpoints from leading professional people—from the fields of medicine, psychiatry, sociology, nursing, rehabilitation, research, counseling, education, and recreation—related to the process of aging.

63.550 Group Dynamics I (2 q.h.)

The group process; how groups arrive at group identity; factors influencing size, purpose, behavior patterns, selections of individual members; training and experience in leadership techniques.

63.551 Group Dynamics II (2 q.h.)

A continuation of Group Dynamics I. Prereq. 63.550.

63.552 Leadership and Program for III, Aged, and Infirm (2 q.h.)

The scope of program planning and leadership in a variety of activities including adapted square dances, drama and puppetry, developing a rhythm band, parties and special events, active and quiet games, and others.

63.553 Techniques and Resources in Working with Elderly (2 q.h.)

Course on how to deal with day to day problems such as the ability to converse or understand different languages; understanding diseases and disabilities of the aged; techniques in assisting the blind or deaf; sensitivity training and sources of assistance in these areas.

63.555 Therapeutic Recreation for Special Groups (2 q.h.)

Concentrated study and individual projects in areas of special interest; mentally retarded, handicapped, aging, and culturally deprived, socially atypical, others.

63.556 Workshop in Adapted and Hospital Recreation (2 q.h.)

Investigation in depth of basic and recent developments in adaptive and hospital recreation. Reports, discussions, observations, and visitations.

63.557 Recreation Activities of Atypical Individuals and Groups (2 q.h.)

Adaptation of recreational activities to meet the needs of handicapped individuals in hospitals and other organizations offering recreation programs for handicapped. Emphasis on the basic principles of recreational therapy.

63.560 Development and Utilization of Recreation Education Resources (2 q.h.)

Survey of field and audio-visual education and resources; instruction and practice in the use of equipment and materials.

63.570 Arts and Crafts I (2 q.h.)

Opportunities to learn and to teach in various media: clay, paper, crayon, paint, print, leather, wood, metal, yarn, natural and scrap materials; emphasis on creativity.

63.571 Arts and Crafts II (2 q.h.)

Course is geared to teach design skills and craft skills at the same time. Present the basic elements of design to plaster, stone, metal, papier mache, clay, wood, wire, cloth, and wax, and exploit the qualities of each medium. Prereq. 63.570.

63.572 Arts and Crafts III (2 q.h.)

Continuation of Arts and Crafts II. Prereq. 63.571.

63.592 Independent Study (3 q.h.)

Independent study designed for the individual specific needs. Field assignments in nursing homes for practical experience. Special and specific assignments. Prereq. 63.501.

63.593 Independent Study (4 q.h.)

Continuation of 63.592. Prereq. 63.592.

63.600 Seminar in Group Dynamics (2 q.h.)

Seminar covering all aspects of motivation, behavior patterns and the general process procedures. Prereq. 63.551.

86 & 87—HEALTH PROFESSIONS

Courses open to all students

86.502 Hospital Law and Ethics (2 q.h.)

A study of important legal principles and rulings of importance to medical administrative personnel and others. Brief introduction to interpersonal ethics in patient care.

86.504 Foundations of Medical Science I (2 q.h.)

Study, primarily through physicians' lectures, of major disease problems in our society and modes of treatment. Intended for the non-medical student who wishes an understanding of the problems faced by the physician in daily practice, to facilitate communication between medical and non-medical members of the health team. Discusses organized care, diagnosis, and treatment.

86.505 Foundations of Medical Science II (2 q.h.)

A continuation of 86.504, emphasizing reproduction, birth, pediatrics. Dental health and dermatology also discussed.

86.506 Foundations of Medical Science III (2 q.h.)

A continuation of 86.505. Heart disease; cancer; stroke; blood and lymphatic diseases; accidents; musculo-skeletal, respiratory, and gastro-intestinal diseases.

86.507 Medical Terminology I (2 q.h.)

An intensive introduction to medical terminology including stems, prefixes, and suffixes. Practice in usage.

86.508 Medical Terminology II (2 q.h.)

A more extensive and in-depth consideration of medical terminology. Intended for the medical records specialist. Prereq. 86.507.

86.509 Medical Terminology (4 q.h.)

Combines the content of 86.507 and 86.508.

86.511 Personal & Community Health (2 q.h.)

Principles of personal health and healthful living and their application to interpersonal relationships and community life. Discusses important contemporary health problems.

86.512 Foundations of Medical Science (3 q.h.)

Combines the content of 86.504 and the first half of 86.505. Offered for day programs only.

86.513 Foundations of Medical Science (3 q.h.)

Combines the content of the second half of 86.505 and 86.506. Offered for day programs only.

86.515 Home Health Care (3 q.h.)

A combination lecture and field training program designed to provide the technical skills required for the provision of effective community home health care. Prereq. permission from the dean.

86.516 Principles and Practice of Community Mental Health (3 q.h.)

The course will provide a rudimentary understanding of the basic principles and techniques of modern community mental health practice. Supervised clinical experience will be provided.

86.521 Public Health I (2 q.h.)

Principles of public health. Organization of health agencies and services.

86.522 Public Health II (2 q.h.)

Continuation of 86.521, emphasizing community organization for health services. Prereq. 86.521.

86.524 Methods & Materials in Public Health Education (2 q.h.)

An introduction to health education in the public health context. Prereq. 86.511 or 86.522.

86.531 Man's Present Environment (2 q.h.)

A survey of environmental conditions in land, air, and water. The causes of pollution; effects on man and other life; and a general discussion of current control methods. Particular emphasis on the significance of environmental problems to the individual.

86.532 Environmental Problems and Control (2 q.h.)

Aspects of environmental engineering on a municipal scale are presented in a format directed to the nonprofessional. Discussion of topics in water supply and water quality, waste water treatment and disposal, solid waste management, milk and food sanitation, and noise control, in the language of the interested citizen.

86.533 Pollution and the Global Environment (2 q.h.)

Threats to the environment on a global scale from man's activities, and an examination of various methods and recommendations for control of atmospheric, oceanic, and land pollution.

86.541 Medical Care & Current Social Problems I (2 q.h.)

Seminar course discussing society's organization to deliver medical care services. Prereq. permission from the dean.

86.542 Medical Care & Current Social Problems II (2 q.h.)

A continuation of 86.541 discussing topics identified in the first part of the course as matters of great concern in the field of medical care. Prereq. 86.541.

86.543 Medical Care & Current Social Problems III (2 q.h.)

A continuation of 86.542, examining current professional literature of medical care. Prereq. 86.542.

**86.545 & 86.546 Contemporary & Controversial Issues in Family Health I, II
(4 q.h.)**

A survey of Contemporary Health Topics will be offered. Timely issues will be analyzed to differentiate fact and opinion. The course is designed for non-medical individuals desiring authentic information on current health matters. General and mental health topics will be covered.

86.548 The Health of the Young Child (2 q.h.)

A course for people working in health programs that reach out to families through clinics; schools, etc. Emphasis on early child development, on relating to the child in his immediate environment, and on expanding observation skills to increase early identification of children with special needs.

86.571 Long-Term Care Administration I (2 q.h.)

The organization of care for the long-term acute and chronically ill patient. Goals and purposes of nursing homes; types. Budgeting, financing, administration, and services.

86.572 Long-Term Care Administration II (2 q.h.)

Nursing units; role of the physician. Nursing home-hospital relationships. Therapies. Social Work. *Prereq. 86.571 or permission from the Dean.*

86.573 Long-Term Care Administration III (2 q.h.)

Design of long-term care facilities, capital funding, staffing, budgeting, public relations. *Prereq. 86.572 or permission from the Dean.*

86.539 Health, Disease & Disability I (2 q.h.) (Formerly 86.574)

A study of the major disease or disability states and their impact on human physiology and psychology. Social and individual response to these states. Lectures, demonstrations, field visits. Part I emphasizes medical areas. *Prereq. 86.506 or 86.513, and 18.306, 18.309, or 18.326.*

86.540 Health, Disease & Disability II (2 q.h.) (Formerly 86.575)

A continuation of 86.574. Part II emphasizes surgical areas. *Prereq. 86.574*

86.577 Long-Term Care Administration IV (2 q.h.)

The nature and problems of aging—individual and social considerations. *Prereq. 86.573.*

86.578 Long-Term Care Administration V (2 q.h.)

The care of elderly patients in home, community, and institutions. *Prereq. 86.577.*

86.579 Long-Term Care Administration VI

Seminar course on the provision and improvement of services to the elderly. *Prereq. 86.578.*

86.581 Hospital Organization & Management I (2 q.h.)

The history and development of hospitals—the contemporary hospital system. Different types of hospital organizations. For middle-management personnel.

86.582 Hospital Organization & Management II (2 q.h.)

A continuation of 86.581; hospital departments, their organization, functions, and interrelationships. For middle-management personnel. *Prereq. 86.581.*

86.583 Hospital Organization & Management III (2 q.h.)

A continuation of 86.582. New methods of patient care. For middle-management personnel. *Prereq. 86.582.*

Courses Open to Medical Record Students Only

86.544 Medical Records Field Practice & Research Seminar (3 q.h.)

Full-time field assignment in affiliated hospital medical record departments with research assignments and regularly scheduled seminar and conference sessions. Prereq. 85.558 & permission.

86.551 Organization of the Medical Record Department I (2 q.h.)

The study of the hospital, patterns of organization, lines of responsibility and authority, medical staff and administrative organization, departmental functions and organization. The planning aspects of management are stressed. Prereq. 86.556.

86.552 Organization of the Medical Record Department II (2 q.h.)

The study of fundamental principles and successful practices in getting office work accomplished. Office management problems and their solution, conceptional framework for the operation of essential management function, facilities, solutions, and contributions to the office.

86.553 Organization of the Medical Record Department III (2 q.h.)

The study of the controlling function in the Medical Record Department. Quality control, time standards, cash controlling, budgeting, and office manuals. Work simplification and systems as it applies to the Medical Record Department.

86.554 Medical Record Science I (4 q.h.)

Introduction to medical records; history of the medical record, and medical record forms. A study of the professional medical record administrator and his relationship to the health facility. Medical staff and committees in the hospital. Quantitative analysis of the medical record. Prereq. 80 q.h. of credit including 18.524, 18.525, 18.526, and 86.507 and 86.508.

86.555 Medical Record Science II (4 q.h.)

A study of the numbering, filing, securing, and preserving of medical records. Includes the study of principles of law as related to patient care and medical records. Study and practice of medical transcription. The rules of privileged communications and the release of information to agencies stressed. Prereq. 86.554.

86.556 Medical Record Science III (4 q.h.)

A study of the basic principles of compiling statistics for hospitals and other health institutions. Includes the preparation of the daily census, discharge analysis, monthly, annual, and special reports. Birth and death certificates. Prereq. 86.555.

86.557 Medical Record Science IV (4 q.h.)

Principles of standardized nomenclature of diseases and operations. International classification of diseases, adapted—8. Study of other indexes used in Medical Record Department, directed laboratory practice for proficiency. Prereq. 86.556 and 86.506.

86.558 Medical Record Science V (4 q.h.)

A study of the new and advanced aspects of medical record science. Includes such topics as skilled nursing facilities, neighborhood health centers, utilization review, PSRO, and cancer registry. Prereq. 86.557

86.559. Current Issues in Medical Record Administration (2 q.h.)

Seminar course discussing new problems presented by changing patterns of medical care. Review of the current literature. Prereq. permission.

86.564. Seminar in Medical Record Science (Open only to full-time medical record majors during senior year) (3 q.h.)

Class discussion of experiences in the clinical setting. Assigned outside projects. Supervised practice.

86.585 Medical Record Computer Science (2 q.h.)

Electronic data processing applications in the medical record environment. The study of the hospital information system. Application of computers in hospital methodology and assessing the need for EDP in medical record-environment. Trends in the state of the art and future prospects for medical record management. Prereq. EDP I and II.

86.586 Applied Medical Record Science I (3 q.h.)

Clinical practice in medical record science and management techniques at one or more of the affiliated hospitals.

86.587 Applied Medical Record Science II (3 q.h.)

Clinical practice in medical record science and management techniques at one or more of the affiliated hospitals.

86.588 Applied Medical Record Science III (2 q.h.)

Clinical practice in medical record science and management techniques at one or more of the affiliated hospitals.

Courses open to Respiratory Therapy Students only.

86.591 Introduction to Respiratory Therapy I (4 q.h.)

The development and understanding of the respiratory therapist's role as a member of the health care profession. A concise survey of the normal structures and functions of the human body with particular emphasis on the organs of respiration and circulation and the principle of oxygen transport and tissue metabolism. An introduction to the physical principles governing gas exchange and the design of mechanical equipment. Prereq. permission.

86.592 Introduction to Respiratory Therapy II (4 q.h.)

A continuation of 86.591 with emphasis on ventilation, acid-base balance, blood gases, cardiovascular physiology, and clinical cardiopulmonary pathology.

86.593 Introduction to Respiratory Therapy III (4 q.h.)

An expansion of 86.591 and 86.592 with emphasis on therapy modalities in current use. Topics covered include gas administration systems, humidity and nebulization, mechanical ventilation, and pulmonary function equipment. Special attention is given to the physical and microbial care necessary in applying these modalities.

Courses open to Special Respiratory Therapy Program Students only.

86.691 Applied Clinical Study I (2 q.h.)

A presentation of the techniques, skills, and rationale for the effective administration of gas, humidity, and aerosol therapy. Also introduce the student to quality patient care concepts necessary to develop the ability to function as a member of the health care team. Prereq. 86.591.

86.692 Applied Clinical Study II (2 q.h.)

A presentation of the techniques, skills, and rationale for the proper and effective administration of intermittent positive pressure breathing and chest physiotherapy with practical clinical application of both. An introduction to the basic concepts of microbiology and problems of immunization with stress on the clinical problems of infection and the techniques of cleaning and sterilization in the clinical setting. Prereq. 86.691.

86.693 Applied Clinical Study III (2 q.h.)

An introduction to the skills, techniques, and rationale necessary to perform proper and effective airway management, cardiopulmonary resuscitation and artificial ventilation therapy presented in the laboratory setting with emphasis on the development of manual dexterity prior to clinical application. Prereq. 86.692.

86.694 Applied Clinical Study IV (6 q.h.)

Clinical application of the techniques and skills acquired in the preceding three quarters, with emphasis on the development of an individual who will provide safe and effective respiratory care, together with a basic introduction to pharmacology, clinical medicine, and disease entities. Prereq. 86.693.

Courses open to Radiologic Technology Students.

86.614 Advanced Radiologic Technology I (2 cl., 2 q.h.)

Review of basic principles; new equipment (operation); special procedures; thermography; ultrasound and video; anatomy and physiology. Prereq. R. T. or special permission.

86.615 Advanced Radiologic Technology II (2 cl., 2 q.h.)

The study of specialized procedures which utilize advanced and sophisticated equipment in the field of: neurology; cardio-vascular, pediatrics, tomography, intraoral, operative procedures. Prereq. 86.614.

86.616 Advanced Radiologic Technology III (2 cl., 2 q.h.)

Accounting principles; budgeting, preparing schedules; personnel practices. Prereq. 86.615.

86.617 Radioactive Isotopes and Therapy I (2 cl., 2 q.h.)

Review of physics, mathematics, anatomy, treatment planning, radiation units of measurement, and introduction to radioisotopes. Prereq. 86.616.

86.618 Radioactive Isotopes and Therapy II (2 cl., 2 q.h.)

Radiobiology, nursing procedures, protection and shielding, and supervoltage equipment. Prereq. 86.617.

86.619 Radioactive Isotopes and Therapy III (2 cl., 2 q.h.)

Specific procedures, records and administrative procedures, clinical application, and radiobiology. Prereq. 86.618.

86.620 Radiologic Technology Orientation I (2 cl., 2 q.h.)

A study of the history of x-rays; medical terminology; nursing and dental procedures pertinent to radiologic technology. Prereq. none.

86.621 Radiologic Technology Orientation II (2 cl., 2 q.h.)

A study of pediatrics and proper methods of immobilizing infants. Necessity for standardizing radiographic exposures to protect the patient. Medical and surgical diseases and the effects they cause on anatomy and physiology and the radiograph. Prereq. 86.620.

86.622 Radiological Science I (4 cl., 4 q.h.)

A survey of the basic concepts of physics; units of measurement; Newton's law of motion; work; energy; atomic theory of matter; electric currents; magnetism; generators; motors; production and control of high voltage. Prereq. none.

86.623 Radiological Science II (4 cl., 4 q.h.)

Interaction of X-rays and matter; nature and production of X-rays, radioactivity; properties of lightwaves; optics; heat transfer and wave motion; dosimetry; X-ray circuits and tubes. Prereq. 86.622.

86.624 Principles of Radiology I (4 cl., 4 q.h.)

Chemistry used to process radiographic films; uses of each chemical. A study of the planes of the body; basic positioning of the skeletal system and more detailed positions utilized to demonstrate anatomical parts to best advantage. Prereq. none.

86.625 Principles of Radiology II (4 cl., 4 q.h.)

Organization factors of hospitals; financial consideration; legal considerations; proper care and maintenance of x-ray equipment; test equipment necessary; special procedures used in radiology and indications for doing them. Prereq. 86.624.

86.626 Radiologic Photography and Exposure I (4 cl., 4 q.h.)

A study of contrast materials used to visualize areas and organs of the body; basic principles of image formation; electromagnetic spectrum; circuits used in radiology; X-Ray tube construction; factors controlling radiographic quality. Prereq. none.

86.627 Radiologic Photography and Exposure II (4 cl., 4 q.h.)

Accessory items used to improve radiographic quality; methods of protection for patients and personnel. Effects of radiation on cells and tissue, malignant and benign; therapy planning and treatment; uses of radioactive nuclides for diagnosis and treatment. Prereq. 86.626.

86.647. Radiology Practicum (12 q.h.) (Formerly 86.628 & 86.629)

Application of theoretical principles presented at the University by performing radiographic procedures under supervision. Assigned homework to be part of lesson plans received while at the hospital, and lectures presented at the hospital and the university. A.M.A. requirement minimum 2 hrs/week.

Courses open to students in Medical Laboratory Science Programs.

87.540 Seminar in Medical Technology (2 cl., 2 q.h.) (formerly 18.529)

Current topics in medical technology. Required readings and presentations by students. Guest lecturers. Prereq. instructor permission.

87.541 Hematology I (1 cl., 3 lab., 2 q.h.) (formerly 18.341)

Basic hematological techniques including discussion of the differential smear and observation of the normal morphology of human red cells, white cells, and platelets. Prereq. 18.512 or equiv. (Laboratory fee)

87.542 Hematology II (1 cl., 3 lab., 2 q.h.) (formerly 18.342)

Morphologic and etiologic classification of the anemias. Related diagnostic tests will be discussed. Prereq. 18.541 or equiv. (Laboratory fee)

87.543 Hematology III (1 cl., 3 lab., 2 q.h.) (formerly 18.343)

Studies of pathologic and physiologic deviations of the white cell series as observed in leukemias and infections. Some animal hematology will be included. Prereq. 18.542 or equiv. (Laboratory fee)

87.544 Epidemiology I (2 q.h.)

Basic concepts in epidemiology. Causes of disease. Factors contributed by agent, the human host, and the environment. Illustrated by case studies.

87.545 Epidemiology II (2 q.h.)

Acquisition and evaluation of data in epidemiology. Relationships of person, time, and place. Case studies and problems.

87.546 Medical Laboratory Science Education Seminar (2 q.h.)

A series of seminars designed to prepare the practicing technologist for effective clinical instruction.

87.547 Medical Laboratory Science Administration Seminar (2 q.h.)

A presentation of the principles of personnel and laboratory management, medical and legal aspects of medical technology, and quality control.

87.508 Introduction to Cytotechnology (2 cl., 2 q.h.)

A review of cell structure, principles of microscopy, and staining techniques. Anatomy and physiology of the female reproduction system and study of the non-malignant cytology of the female genital tract. Prereq. 18.132 or equivalent. (Laboratory fee)

***87.518 Applied Cytology I (At Hospital, 4 q.h.)**

The microscopic evaluation and screening of benign cytological smears and smears from cervical dysplasia, carcinoma-in-situ, invasive squamous cell carcinoma and adenocarcinoma, and invasive malignant tumors of the female genital tract.

*Available only to students enrolled in the 12-month professional cytology program.

87.528 Cytopathology I (2 cl., 2 q.h.)

Cytopathology and clinical aspects of cervical dysplasia, carcinoma-in-situ, and invasive squamous cell carcinoma. Consideration of endometrial and endocervical carcinoma, other genital tract cancers and radiation effect. Prereq. 87.508. (Laboratory fee)

87.538 Cytopathology II (2 cl., 2 q.h.)

Benign and malignant cytology of the respiratory and gastrointestinal systems correlated with the anatomy and physiology. Considerations of clinical aspects. Special collection techniques. Emphasis on cancer of the lung and stomach. Prereq. 87.528. (Laboratory fee)

***87.548 Applied Cytology II (At Hospital, 4 q.h.)**

The microscopic evaluation and screening of cytological smears from the respiratory tract, gastrointestinal tract, urinary tract, and from body fluids. Continuing evaluation of Cytological smears from the gynecological tract.

87.558 Cytopathology III (2 cl., 2 q.h.)

Study of benign, atypical and malignant cells exfoliated from various portions of the urinary tract, in serous effusions, cerebrospinal fluid, and breast secretions. Prereq. 87.528. (Laboratory fee)

87.568 Cytogenetics and New Concepts (2 cl., 2 q.h.)

Clinical and cytological aspects of genetics, including genetic counseling. Special uses of cytology. Cell research techniques, cancer. Epidemiology, and current concepts related to cytotechnology. Prereq. 87.558 or permission of instructor. (Laboratory fee)

***87.578 Applied Cytology III (At Hospital, 4 q.h.)**

The microscopic evaluation and screening of cytological smears from all parts of the body. Practical experience in genetic cytology.

87.588 Cytopathology Seminar.

Advanced course for students in baccalaureate degree program. Discussion of pertinent journal reports, new methodologies, and research. Prereq. Permission of instructor.

87.598 Special Topics (2 cl., 2 q.h.)

Special projects in cytology, cytopathology, or cytotechnology investigated or reviewed and reported by student. Written and oral presentation required. Prereq. 87.558 or permission of instructor.

87.608 Seminar: Cytopathology — Criteria and Correlations (4 cl., 2 q.h.)

Presentation, discussion, and interpretation of benign, suspicious, and hormonal conditions. The cytological diagnostic criteria of malignant tumors from various body sites and their histopathological correlation.

***87.618 Applied Cytology IV (2 q.h.) (at hospital)**

The microscopic evaluation and screening of cytological smears from various body sites. Effects of radiation and of chemotherapy; diagnosis of suspicious and hormonal conditions; cytological observations in pregnancy; and the clinical significance of these.

*Available only to students enrolled in the 12-month professional cytology program.

94—LAW ENFORCEMENT

94.505 Human Rights in Corrections (2 q.h.)

Consideration of the special practices and problems in the protection of human rights in the institutional environment; legal and practical aspects.

94.506 Basic Statistics in Law Enforcement (2 q.h.)

Introduction to basic statistical information procedures and operations relating to law enforcement areas; interpretation of criminal statistics; crime rates; unrecognized crime; non-reporting; recidivists' rates; individual statistics; evaluation of records; research and data on specialized services.

94.507 Correctional Counseling (2 q.h.)

Basic concepts and principles of counseling; individual and group therapy carried on in the correctional field and institutional services; case study and projects.

94.508 Criminal Investigation and Case Preparation I (2 q.h.)

General investigation techniques; collection and preservation of evidence and information; consideration of particular crimes, including arson, sexual offenses, larceny, burglary, robbery, forgery, and homicide.

94.509 Criminal Investigation and Case Preparation II (2 q.h.)

Conduct of raids; surveillance and undercover operations; methods of preparing a case for court; specialized scientific methods; exercises involving techniques of prosecution and cross-examination. Prereq. 94.508.

94.512 Comparative Police Systems (2 q.h.)

A study of existing police systems in other jurisdictions; examination of the organization, administration and practices in police agencies in the United States, Europe, and the United Kingdom.

94.513 Introduction to Industrial Security (2 q.h.)

The historical, philosophical, and legal basis of security; a survey of administrative, personnel, and physical aspects of the security field.

94.514 Interviews and Interrogations I (Formerly Police Interrogation I.)

(2 q.h.)

Interviewing of victims, witnesses, informants, and complainants; demonstration, study, discussion, and practice of techniques and procedures.

94.515 Interviews and Interrogations II (Formerly Police Interrogation II.)

(2 q.h.)

Techniques for legally acceptable questioning of suspects and persons in custody; laws governing interrogation practices; demonstrations, class exercises and assigned projects. Prereq. 94.514.

94.516 Security Administration (2 q.h.)

Administration, organization and operations of security and protection units; personnel selection; relationships of business and industry with governmental units.

94.517 Advanced Correctional Practices I (2 q.h.)

Diagnosis and treatment of the drug addict and the alcoholic offender at both juvenile and adult levels; a study of these and related kinds of personal self-abuse as to causation and treatment. Prereq. 94.553.

94.518 Advanced Correctional Practices II (2 q.h.)

Case studies of persons confined as to their past and present environment and relationships; consideration of purposeful resolves or regressions. Prereq. 94.517.

94.519 Advanced Correctional Practices III (2 q.h.)

Evaluation of correction-psychiatric facilities for the disordered offender, including the aggressive, the assaultive, and the violent subject. Prereq. 94.518.

94.520 Traffic Safety and Control I (2 q.h.) (Formerly titled Traffic Law Enforcement I.)

A study of the state of the art of highway safety; research; traffic accident investigation; prevention; rescue; automated system of vehicular traffic accident and moving violation data collection; analysis and utilization; speed control; speed zoning techniques; radar; vascar; laws, rules, and regulations.

94.521 Traffic Safety and Control II (2 q.h.) (Formerly titled Traffic Law Enforcement II.)

An in-depth study of traffic law enforcement, techniques of selective enforcement; traffic surveys; engineering, safety education, and evaluation of current traffic programs. Prereq. 94.520.

94.523 The Law and Institutional Treatment (2 q.h.)

The process of law from arrest of offender through release in its relation to correctional principles and practices; functions of police, defense, prosecution, and courts; legal documents related to commitment.

94.524 Comparative Correctional Systems (2 q.h.)

A study of correctional systems and methods in selected jurisdictions; examination of the organization, administration, and practices in United States and foreign countries.

94.525 Law Enforcement Identification and Records I (2 q.h.)

Records and systems and utilization; survey of forms, files, procedures, standards and uniformity; concentration of theoretical and practical applications.

94.526 Law Enforcement Identification and Records II (2 q.h.)

Theories and practices in personal identification principles; survey and evaluation of present and new identification techniques; historical and legal consideration of identification and record data. Prereq. 94.525.

94.530 Police Public Relations (2 q.h.)

The principles of sound public relations for the entire police operation; writing, public speaking, conferences, and all news media; consideration of police image and public opinion.

94.531 Police Community Relations (2 q.h.)

A survey of the role and function of police in intergroup relations; human relations and minority groups; responsibilities of police with civil rights, civil disorders, and public protection.

94.532 Research Methods in Criminal Justice (2 q.h.)

A research project related to some specific police or correctional interest or operation, in consultation with the faculty adviser. Course meets at discretion of the instructor. Project paper required for grade.

94.536 The Patrol Function I (Formerly Police Patrol I.) (2 q.h.)

The planning process related to the administration of the patrol function. Consideration of theoretical and operational aspects of various patrol systems; random patrol, response force, split force, team policing, probability theory, and the relationship between patrol and crime levels.

94.537 The Patrol Function II (Formerly Police Patrol II.) (2 q.h.)

A continuation of 94.536 with emphasis upon the goals and objectives of police patrol management models. Discussion and analysis of manpower, work load, response time, patrol communications, preventive strategies, and inputs and outputs of patrol systems evaluated in quantitative form. Prereq. 94.536.

94.541 Introduction to Criminalistics I (2 q.h.)

A survey of the elements of microscopy, spectroscopy, and chemistry as applied to trace evidence in criminal investigations; responsibilities of technician, investigator, and others.

94.542 Introduction to Criminalistics II (2 q.h.)

Toxicology and serology; procedures related to other physical evidence; laboratory demonstrations and practical exercises. Prereq. 94.541.

94.544 The American Correctional System (2 q.h.)

A critical survey of the correctional field covering probation, institutions, and parole as to historical development, program content, and current problems and needs.

94.546 Social Deviance I (2 q.h.)

A consideration of the social problems of social disorganization, mental disorders, drug addiction, alcoholism, suicide, and sexual behavior.

94.547 Social Deviance II (2 q.h.)

Continuing consideration of world's population crisis, race and ethnic relations, family disorganization, work and automation, poverty and disrepute, war and disarmament. Prereq. 94.546.

94.549 Treatment of Offenders I (2 q.h.)

The concept of treatment and corrections; history; classification; training, education and guidance; treatment methods; inmate society; health and social services.

94.550 Treatment of Offenders II (2 q.h.)

Therapy, psychiatric and psychological considerations, case studies, evaluation of comparable methods. Prereq. 94.549.

94.551 Correctional Administration I (2 q.h.)

Correctional processes and services, standards, personnel and principles of management; allocation of resources, training of staff.

94.552 Correctional Administration II (2 q.h.)

Study of regular and special programs, volunteers, outside contacts, sentence reduction, discharge planning, work release administration.

94.553 Correctional Administration III (2 q.h.)

Types of institutions; compacts; regional concepts; planning, organizing, controlling, and directing corrections; budgeting. Prereq. 94.552.

94.557 Investigative Report Writing (2 q.h.)

Report content and writing, exercises in accurate terminology and concise reporting, interpretation and evaluation of information, practical report-writing projects.

94.560 Police Supervision (2 q.h.)

The police supervisor's role in discipline; interdepartmental relations; problem handling and personnel policies; problems in supervisory relationships; wages, grievances, morale, and safety.

94.561 Police Work with Juveniles (2 q.h.) (Formerly titled Police Juvenile Methods)

The role of the police in delinquency prevention with emphasis on theory, administration, control, treatment, confinement, community resources, and relationships with the public and the juvenile court.

94.563 Criminology I (2 q.h.)

An introduction to the study of crime from the perspective of classical and contemporary criminological theories. In particular, attention is given to biological, psychological and sociological approaches to the explanation of crime.

94.564 Criminology II (2 q.h.)

A continuation of Criminology I with emphasis on the causes of crime and the relationship between law and crime. Specific implications of prevention, rehabilitation and treatment are considered in depth. Prereq. 94.563.

94.565 Delinquency Prevention (2 q.h.)

A survey of delinquent behavior, causation, and delinquency prevention programs; seminar projects for discussion of specific problems and general principles in establishing delinquency prevention services.

94.567 Probation and Parole Practices I (2 q.h.)

The probation officer; presentence investigation; conditions of probation; effectiveness, administrative aspects and prediction methods; relationship to community.

94.568 Probation and Parole Practices II (2 q.h.)

The parole officer; conditions of parole; supervision; effectiveness; administrative relationships; relationships to community, court and law enforcement agencies; relationships of probationer and parolee to rehabilitative, social, and family services; consideration of recidivism; aftercare.

94.571 Law Enforcement Management and Planning I (2 q.h.)

Philosophy and theories of management in law enforcement; studies of organization from the administrator's viewpoint, including control, efficiency, effectiveness, and discipline.

94.572 Law Enforcement Management and Planning II (2 q.h.)

A survey of the administrator's role, including special activities and responsibilities; administrative planning; civilian personnel, including recruitment, selection, evaluation; training; budgets; management records; interpersonal communications; auxiliary services; evaluation of present and future management systems. Prereq. 94.571.

94.574 Juvenile Corrections I (2 q.h.)

A study of police, detention, petition, and hearings related to juveniles; juvenile court procedures, philosophy, and terminology; adjudication.

94.575 Juvenile Corrections II (2 q.h.)

Social workers, probation officers, judges, psychologists, and psychiatrists with relation to juveniles; institutions; aftercare; prevention. Prereq. 94.574.

94.577 Government Security Programs I (2 q.h.)

Department of Defense security programs; applicable federal statutes and executive orders; visitor control.

94.578 Government Security Programs II (2 q.h.)

Security clearances under appropriate federal directives; handling classified information; automatic time-phased downgrading and declassification.

94.579 Government Security Programs III (2 q.h.)

Relations with subcontractors, vendors, and suppliers; the protection of proprietary information; legal and practical protection of sensitive data. Prereq. 94.578.

94.582 Document Control (2 q.h.)

A detailed study of procedures for handling and control of classified and other sensitive information; a survey of control systems from manual to semi-automated systems using data processing equipment.

94.583 Industrial Fire Prevention (2 q.h.)

Principles and practices of fire safety, including organization and management responsibility, property conservation, safeguards for construction, fire control apparatus and functions, engineering and scientific data on fires and related perils.

94.584 Physical Security I (Formerly Plant Protection I.) (2 q.h.)

The basic foundations for security in industry, banking, transportation, utilities, and other nongoverning operations; physical requirements and standards.

94.585 Physical Security II (Formerly Plant Protection II.) (2 q.h.)

Implementation of security; study of inanimate aspects, including alarm and surveillance devices; study of animate aspects of protection. Prereq. 94.584.

94.586 Retail Security (2 q.h.)

The operation of security departments including functions of mercantile establishments; dishonest employees; shoplifters; management and public relations; receiving, shipping, and warehousing; special laws and procedures.

94.587 Bank Security Measures (2 q.h.)

(Formerly Security Measures for Financial Institutions.)

An in-depth study of the principles and practices of security measures for banks and other financial institutions and the preparation of rules establishing minimum standards under current federal and state legislation.

94.591 Seminar in Security (2 q.h.)

(Formerly Seminar in Industrial Security.)

An analysis of current problems in security such as growth patterns, salary structures, training and education, existing weaknesses; field trips, individual study assignments, and required oral and written reports.

94.593 Seminar in Correctional Practices (2 q.h.)

(Formerly Seminar in Correctional Program Management.)

An analysis of current problems in corrections designed to meet the needs and interests of specific groups of students, practitioners, supervisors, and administrators of correctional programs.

94.595 The National Law Enforcement Seminar (3 q.h.)

An annual, concentrated exploration of current viewpoints, varied solutions, innovative procedures, and critical analyses in the issues facing law enforcement, correctional practices, and security, drawing on exceptionally qualified local and national figures. A research paper under the direction of a faculty adviser is required for credit. Open to L.E. majors & Crim. Just. Personnel only.)

94.596 Hospital Security (2 q.h.)

The function of protection in the health industry; medical security administration including study of health care providers; trends in hospital law; security from injury, fire and loss in the medical world; security methodology for safeguarding specialty areas; the security role in mass casualty management and emergency preparedness; the concept of professionalism; community liaison; and patient attitudes toward security.

94.597 Current Security Problems (2 q.h.)

An analysis of special problem areas such as security education and training, community relations, white-collar crime, drug abuse, theft control, shoplifting, document control, subversion and sabotage, protection of classified information, control of proprietary information and business espionage, labor problems, civil disturbances, and natural and man-made disasters.

94.601 Law Enforcement Math I (Formerly Seminar in Law Enforcement 94.590.) (2 q.h.)

A review of elementary algebra: algebraic expressions and operations, equations, word problems. Solutions to mathematical problems in connection with their practical applications in law enforcement.

94.602 Law Enforcement Math II (2 q.h.)

Further review: fundamental operations, measurement and computation, solutions of linear and quadratic equations. Probability, trigonometry, statistics, ratio and proportion. Prereq. 94.601.

94.603 Law Enforcement Math III (2 q.h.)

Methods and applications of algebra: analytic geometry, equations of motion and energy, permutations, combinations. Stress is on problem-solving more than theory. Application of these principles are applied to most areas of law enforcement. Prereq. 94.602.

94.604 Seminar in Law Enforcement (Youth Crime Control) (2 q.h.)

The criminality and deviance of those between the juvenile and adult age. Consideration is given to: concepts and characteristics of the youthful offender; the role of the family in youth crime; the generation gap; violence of youth hooliganism; drug addiction of youth; ordinary crimes of youth; the youth sub-culture and culture conflict; the role of mass media and education in youth crime; the concepts of freedom and justice in the youth culture; treatment of youthful offenders; and the state of youth crime control in foreign countries.

94.605 Seminar in Law Enforcement (Victimology) (2 q.h.)

Criminal-victim relationships, with emphasis on victim precipitated crimes and compensation to the victims. Consideration is given to: concept and significance of "victimology;" time, space, sex, age, and occupational factors in criminal-victim relationships; victims of murder, rape, other violent crimes, and property crimes; victim-typology; the public as victim; restitution to victims of crime; compensation to victims of crime; and the functional responsibility of the victim.

94.606 Seminar in Law Enforcement (International Crime Control) (2 q.h.)

Crimes touching upon more than one country, with emphasis on international criminal law principles, treason, and espionage. Concentration is given to: the concept of law in its comparative aspects; customs; treaties; international conventions; "comity;" culture conflicts; the "international personality;" the "attempt clause;" the Belgian approach; the Oxford approach; asylum, extradition; international ordinary criminals; political criminals; piracy (on sea and in the air); war criminals; genocide; international courts; League of Nations; United Nations; international criminal statistics; Interpol, the Soviet-type spy-schools; the history of American Intelligence.

94.607 Seminar in Law Enforcement (Grantsmanship) (2 q.h.) (Formerly Seminar in Law Enforcement 94.590.)

This seminar is designed to familiarize the participants with the orderly sequence of organizational steps required in providing the institutional framework necessary for preparation and submission of applications to granting agencies. Major topics include: Omnibus Crime Control and Safe Streets Act of 1968 functions of the Law Enforcement Assistance Administration; grant application strategy, planning and research.

94.608 Seminar in Law Enforcement (Law Enforcement Operational Intelligence) (2 q.h.) (Formerly Seminar in Law Enforcement 94.590.)

Designed to provide a theoretical understanding of the value and function of ai

ntelligence unit, including planning, directing, organizing, financing, and other salient features of the administration of these units. Emphasis is placed on organized crime; subversive activities, and liaison programs as they apply to a modern police agency.

94.609 Independent Studies (2 q.h.)

Faculty guided research in individually selected topics relating to the criminal justice system.

94.610 Seminar in Law Enforcement (Collective Bargaining) (2 q.h.) (Formerly titled Seminar in Law Enforcement 94.590.)

The history and background of collective bargaining in the public sector as it affects members of the law enforcement field; initial establishment of rights of labor, labor legislation—federal and state; preparation for negotiation, resolutions of impasses, final agreement and operation of the contract.

94.611 Man, Law, and Society I (2 q.h.)

Designed to help the student to improve his capacity to handle problems in the many institutions and sociological processes of the American legal system, and to see these problems in the perspective of their everyday working interrelationships, in order to heighten his awareness of those aspects of familiar and often unnoticed legal problems which call for a perceptive understanding of the functions of the various institutions involved.

94.612 Man, Law, and Society II (2 q.h.)

A general analysis of the way in which major changes occur in the established practices of legal and social organizations and communities. Particularly concerned with the part played by legal institutions in initiating, controlling, and directing or assisting such changes.

94.613 Man, Law, and Society III (2 q.h.)

An introduction to the social science concepts and methods in their current and potential application to social and legal problems. Aims to acquaint the student with a variety of social research concepts and methods of special utility in investigating diverse types of social law related problems.

94.614 Seminar in Law Enforcement (Interviewing Practicum) (2 q.h.) (Formerly Seminar in Law Enforcement 94.590.)

Advanced interrogation methods and procedures; techniques of persuasion; conditioning (negative and positive); the polygraph, its history and methodology; the established rules and procedures required for current diagnosis of truth and deception; the evaluation of the contemporary methods of international law enforcement agencies. Prereq. 94.515.

94.615 Seminar in Law Enforcement (Organized Crime) (2 q.h.) (Formerly Seminar in Law Enforcement 94.590.)

The nature and problems of organized crime; causes and effects; comparative and historic roots; the activities, organization, and economics; possible solutions—the scope and techniques in combating organized crime.

94.616 Seminar in Law Enforcement (Minorities and the Urban Crisis) (2 q.h.)
(Formerly Seminar in Law Enforcement 94.590.)

An investigation of the ethnic and racial origins and characteristics of the American people; the interaction, conflicts, and possibilities of adjustment between the dominant society and minority groups—particularly in contemporary urban settings, and the role and function of police in their inter-relationship with minority groups.

94.617 Seminar in Law Enforcement (Criminal Behavior) (2 q.h.)
(Formerly Seminar in Law Enforcement 94.590.)

An examination of crime and criminal behavior as a social phenomenon. Three principal divisions; sociology of law and its effect; criminal etiology and the scientific analysis of the causes of crime; evaluation of the various rationals of detention as a crime control factor.

94.618 Seminar in Law Enforcement (Prosecutive Development) (2 q.h.)
(Formerly Seminar in Law Enforcement 94.590). Prereq. 94.502, 94.504, 94.509.

Lecture and discussion relating the professional requirements of the modern police officer in the United States; oral testimony; the entire corpus delicti and all other related matters in proper form and sequence; the trial; testimony and the jury; conduct on the witness stand; opposition counsel; the defense of entrapment; opinion testimony; confessions; prospective witnesses; legal standards and the police. Prereq. 94.501, 94.504, 94.510.

94.619 Seminar in Law Enforcement (Forensic Laboratory) (2 q.h.)
(Formerly Seminar in Law Enforcement 94.590.)

Crime laboratory organization and the utilization of special equipment for the analysis interpretation, classification, and identification of physical evidence obtained in crime scene searches. The transportation, storage, and security of physical evidence and the effect of the results, coupled with the preparation of exhibits for courtroom presentation. Prereq. 94.542. (Laboratory fee)

94.620 Seminar in Law Enforcement (Intervention Strategies and Tactics for Law Enforcement — Counseling Techniques) (2 q.h.)
(Formerly Seminar in Law Enforcement 94.590.)

Basic concepts and principles of intervention as a social work method. Nature of therapeutic relationships, principles of communication. Diagnostic assessment of the person-problem-situation configuration. Goal-setting process. Egocentric supportive procedures and use of community resources.

94.621 Civil-Liberties and the Police I (2 q.h.)

(Formerly Seminar in Law Enforcement 94.590.)

An in-depth preparation for the officer facing the practical problems of enforcing the law without breaching the civil rights of the accused and bystanders; individual readings, lectures, group discussions, and preparations from Massachusetts and national interest cases; many incidents pertinent to the actions of the men involved with these problems will be investigated and studied; constitutional interpretation and limitations are the guidelines for the course.

94.622 Civil Liberties and the Police II (2 q.h.)

Several Supreme Court cases are followed from the time of the call, to the confrontation, arrest, examination in court, appeals, and the direct statements on the problem by jurists of the highest courts. The last section of the term lies in the latest criminal law and civil rights act changes including—but not limited to—the criminal justice and no knock laws and the latest Civil Rights Act provisions. Prereq. 94.621.

94.623 Seminar in Law Enforcement (Drugs) (2 q.h.) (Formerly Seminar in Law Enforcement 94.590.)

Designed to meet the needs of law enforcement personnel in the problematic area of drug abuse; the law, society classification, distribution, identification, and the effects of drugs.

94.624 Seminar in Law Enforcement (Executive Development) (2 q.h.) (Formerly Seminar in Law Enforcement 94.590.)

The role of the police administrator within the managerial structure. Special problems unique to the law enforcement executive, decision making, policy formation, planning, controlling, communicating, and directing. A consideration of case studies and surveys will be utilized.

94.625 Seminar in Law Enforcement (Mental Health and the Police) (2 q.h.) (Formerly Seminar in Law Enforcement 94.590.)

A study of the roles of law enforcement and mental health services. Diagnosis of the triggering mechanisms of behavioral disorders and the suicidal phenomenon; psychiatric and psychological considerations; case studies and the legal process.

94.626 Seminar in Law Enforcement (Data Processing) (Formerly Seminar in Law Enforcement 94.590.)

An introduction to automated systems utilized in the field of law enforcement; basic program concepts; filing and sorting techniques; available input and output storage media; types and sources of data communications and applications.

94.627 Administration of Justice I (2 q.h.) (Formerly 94.501.)

A survey of the evaluation of justice from the earliest times, developed historically, with particular emphasis on Western justice and American justice, including the roles played by the judiciary, with stress on due process and the constitutional guarantees.

94.628 Administration of Justice II (2 q.h.)

An analysis of the various groups and professions in the American justice system. Emphasis is fixed on human relations, efficiency, current trends and the future role of the American criminal justice system. Prereq. 94.627.

94.629 Civil Law in Criminal Justice I (2 q.h.) (Formerly 94.511.)

Civil matters such as defamation, negligence, assault and battery, false confinement, trespass, conversion, and agency relationships.

94.630 Civil Law in Criminal Justice II (2 q.h.)

Civil matters such as the law of contracts, bailments, domestic relations and business relationships which should be known to and distinguished by law enforcement personnel. Prereq. 94.629.

94.631 Criminal Law I (2 q.h.)

Exploration of the major problems of criminal law as a device for controlling socially undesirable behavior. It is intended to give one a working knowledge of the basic questions of public policy involved in the administration of criminal justice and the legal principles of determining criminal liability. Course includes a consideration of specific crimes, elements of a crime, parties to a crime, and defenses to a crime.

94.632 Criminal Law II (2 q.h.)

Consideration of vital constitutional and statutory concepts, including self-incrimination, search and seizure, law of arrest, criminal procedure and responsibility, confessions, right to counsel, and conduct of trial in the District, Superior, Appellate and Federal Courts. Prereq. 94.631.

94.633 Evidence and Court Procedure I (2 q.h.)

Rules of evidence; principles of exclusion; evaluation and examination of evidence and proof.

94.634 Evidence and Court Procedure II (2 q.h.)

Competency, consideration of witnesses, laws of search and seizure, court procedures, moot court exercises. Prereq. 94.633.

94.650 Fire Investigation and Arson I (2 q.h.)

A study of the elementary chemistry of combustion involving sources of ignition, fuels, the nature and behavior of gases and their toxicity. The combustion properties of non-solid fuels as opposed to the combustion properties of solid fuels are considered. Also consideration is given to explosions associated with fires. A discussion of the socio-economic aspects of fire including the pyromaniac and his physiological and psychological involvement.

94.651 Fire Investigation and Arson II (2 q.h.)

A more concentrated approach is taken in dealing with the fire bug and his sociological orientation. A discussion of carbon, hydrogen, and oxygen as major elements in all fires and the flameless ignition effect. Methods of fire proofing are also considered and references made to various types of building materials as well as the role of pyrolysis. Fire patterns of structural fires and asphyxiation along with the legal aspects of arson are also considered. Prereq. 94.650.

94.652 Law Enforcement Fiscal Management

The various budgeting systems and their application to law enforcement organizations including: the line item budget, programmed budget, performance budget, and the planned programmed budget system; development of sound fiscal policy; appropriation of funds; tax base revenue systems; distribution of public monies; budget request, expenditures, and auditing procedures.

94.653 Massachusetts Criminal Law

A comprehensive study of Massachusetts Criminal Law and its application by law enforcement officers. Areas of study include: Common Law, Criminal Statutes, Annotated Laws, Criminal Case Law, Supreme Court Decisions, and Motor Vehicle Law.

4.658 Alcohol Problems in Law Enforcement

cquaints students with the current state of knowledge on society, culture, nd drinking patterns; the variety of alcohol problems that confront peace fficers; discussion` of the range of solutions available.

4.697 Honors Program I (4 q.h.)

rereq. Approval of the Dean.

4.698 Honors Program II (4 q.h.)

rereq. 94.697.

4.699 Honors Program III (4 q.h.)

rereq. 94.698.

INTENSIVE COURSES

he following are intensive courses. Please refer to the combination numbers or the individual course description previously listed in this catalog.

7.500 Administration of Justice (Intensive) (4 q.h.)

ombination of 94.627 and 94.628.

7.501 Criminal Law (Intensive) (4 q.h.)

ombination of 94.631 and 94.632.

7.502 Evidence and Court Procedure (Intensive) (4 q.h.)

ombination of 94.633 and 94.634.

7.503 Civil Law in Criminal Justice (Intensive) (4 q.h.)

ombination of 94.629 and 94.630.

7.504 Civil Liberties and the Police (Intensive) (4 q.h.)

ombination of 94.621 and 94.622.

7.505 Interviews and Interrogations (Intensive) (4 q.h.)

ombination of 94.514 and 94.515.

7.506 Traffic Law Enforcement (Intensive) (4 q.h.)

ombination of 94.520 and 94.521.

7.507 Law Enforcement Identification and Records (Intensive) (4 q.h.)

ombination of 94.525 and 94.526.

7.508 Introduction to Criminalistics (Intensive) (4 q.h.)

Combination of 94.541 and 94.542.

7.509 Social Deviance (Intensive) (4 q.h.)

Combination of 94.546 and 94.547.

7.510 Law Enforcement Management Planning (Intensive) (4 q.h.)

Combination of 94.571 and 94.572.

97.511 The Patrol Function (Intensive) (4 q.h.)

Combination of 94.536 and 94.537.

97.512 Criminal Investigation and Case Preparation (Intensive) (4 q.h.)

Combination of 94.508 and 94.509.

97.513 Criminology (Intensive) (4 q.h.)

Combination of 94.563 and 94.564.

97.514 Treatment of Offenders (Intensive) (4 q.h.)

Combination of 94.549 and 94.550.

97.515 Probation and Parole Practices (Intensive) (4 q.h.)

Combination of 94.567 and 94.568.

97.516 Fire Investigation and Arson (Intensive) (4 q.h.)

Combination of 94.650 and 94.651.

97.517 Advanced Correctional Practices (Intensive) (6 q.h.)

Combination of 94.517, 94.518, 94.519.

97.518 Correctional Administration (Intensive) (6 q.h.)

Combination of 94.551, 94.552, 94.553.

97.519 Law Enforcement Mathematics (Intensive) (6 q.h.)

Combination of 94.601, 94.602, 94.603.

97.520 Government Security Programs (Intensive) (6 q.h.)

Combination of 94.577, 94.578, 94.579.

97.521 Man, Law and Society (Intensive) (6 q.h.)

Combination of 94.611, 94.612, 94.613.





university college faculty

*Designates Senior Lecturer as of September, 1973.

Herbert Abrams, J.D., M.L.

Criminal Law Evidence & Procedure

Herbert Abrams, Counsellor at Law

Roger L. Ackels, B.S., M.B.A.

Marketing General Motors

Mary Katherine Achorn, B.A.

Medical Terminology
Children's Hospital Medical Center

*Henry Adleman, B.S.

Management Information Systems
Digital Equipment Corporation

Kenneth Aft, B.S.E.E.

Industrial Management

*John P. Agnew, A.B., M.A., Ph.D.

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Pine Manor Junior College

Thomas J. Ahern, Jr., B.A., J.D.

Law
Silver & Ahern

H. David Ahlberg, A.B., Ph.D.

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Mohiuddin Ahmed, M.S., Ph.D.

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Joseph Aieta, III., B.S., M.A., M.A.

History
Lasell Junior College

John J. Aldrich, B.A., M.Ed.

Earth Science
Wellesley Junior High School

Patricia Maloney Alt, B.A., M.A.

Political Science

Israel Aluf, B.A., M.A., Ph.D.

German

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Lois W. S. Ames, B.A., M.A.

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Frederick Andelman, B.A., M.A.

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Beverly J. Anderson, A.B., M.A.

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Harley H. Anderson, B.S., M.B.A., J.D.

Law

Northeastern University

Paul Anderson, B.S.

Fine Arts

Robert E. Anderson, B.S.

Management Information Systems

Coordinator

Anderson Associates

Ruth T. Anderson

History

Stanley S. Antoniotti, B.A., M.A.

Economics

Bridgewater State College

Harriet J. Aranoff, B.A., M.A.

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Dion J. Archon, A.B., A.M., Ph.D.

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Suffolk University

Alfred E. Attard, B.S., M.A., Ph.D.

Chemistry

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Jason M. Avergun, B.S., M.E., M.B.A.

Marketing

York Division

Borg-Warner, Inc.

Warren F. Averill, B.S., M.S.

Chemistry

Research Chemist, Ionics Inc.

Master, Boston Latin School

Patricia A. Babcock, B.A., A.M., Ph.D.

English

Lynn Daily Evening Item

David Bachrach, A.B., M.A., Ed.M.

Psychology

V.A. Hospital

Carolyn W. Bailer, B.A., M.A.

History

WBZ Westinghouse

Anthony J. Bajdek, B.A., M.A.

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Errol H. Baker, B.A., M.A.

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Alan R. Balboni, B.A., M.A., Ph.D.

Political Science

Boston State College

Dorothy J. Bales, B.A., B.Mus., M.Mus.

Music

Emmanuel College

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Biology
 Lynn Public Schools
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Psychology
 Military Stress Lab.
 U.S. Army Research Inst.
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Management
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- *Norman F. Barbeau
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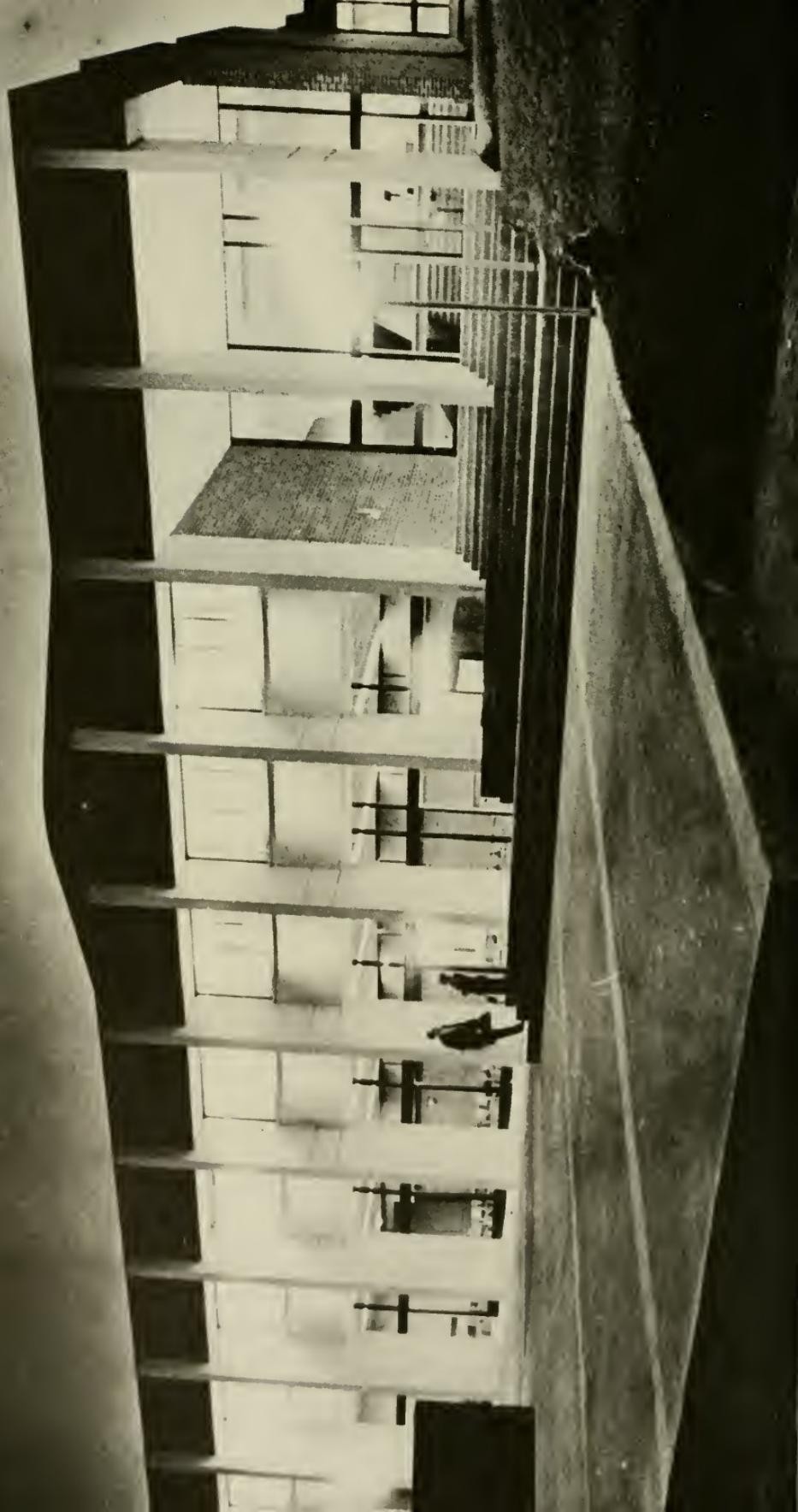
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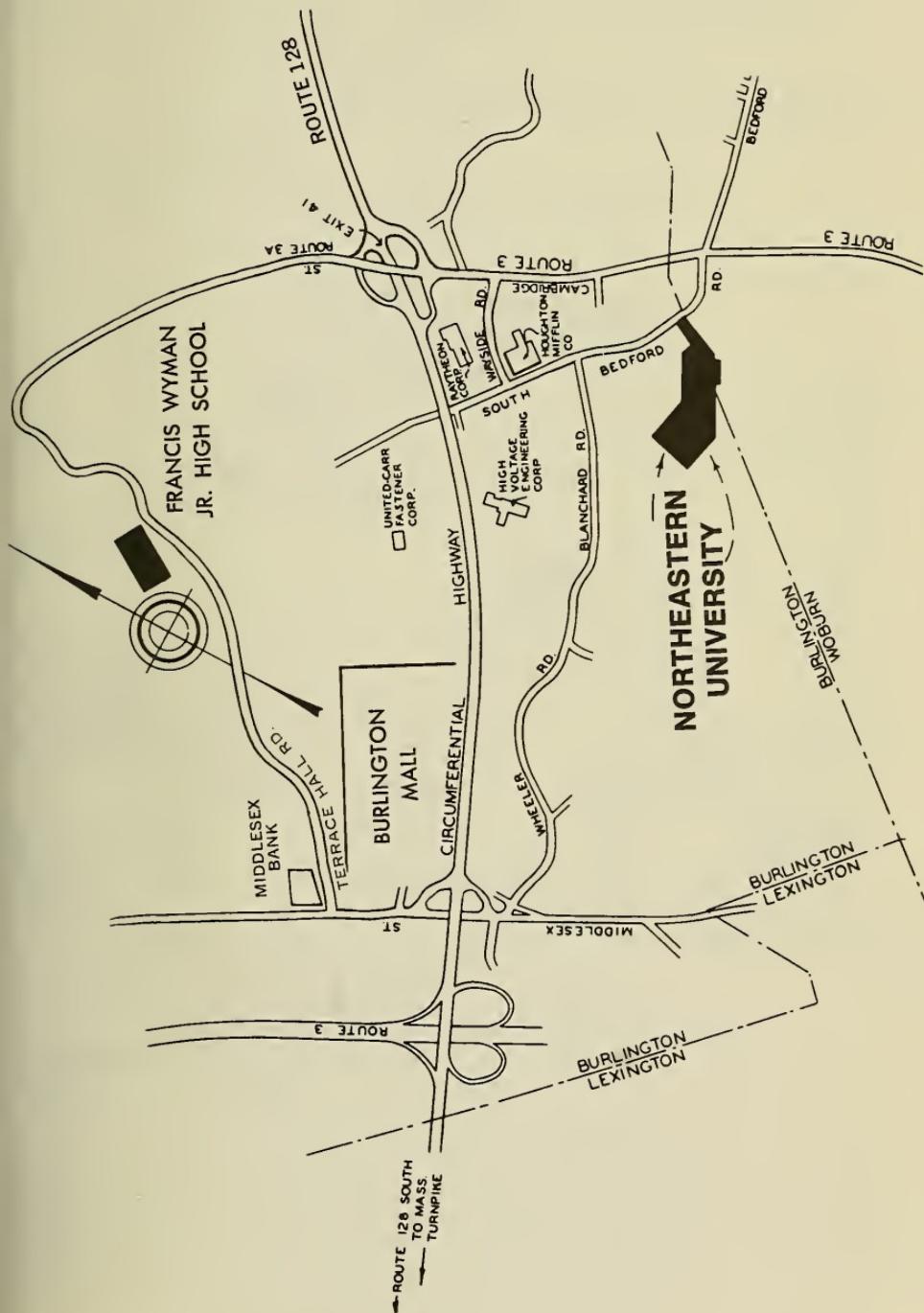
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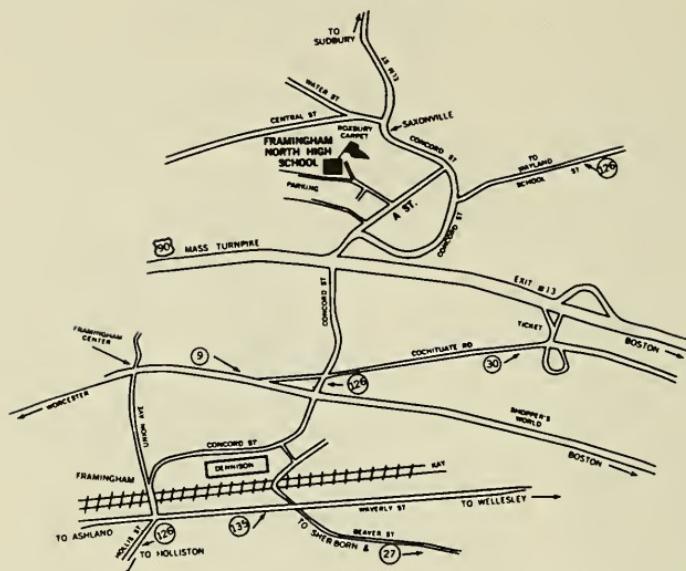


suburban maps

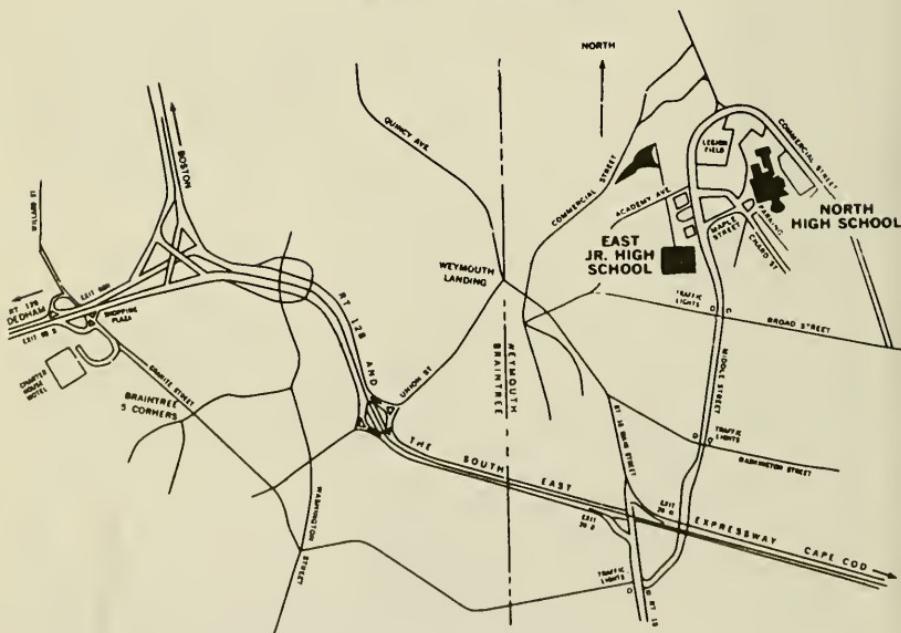
Suburban Campus



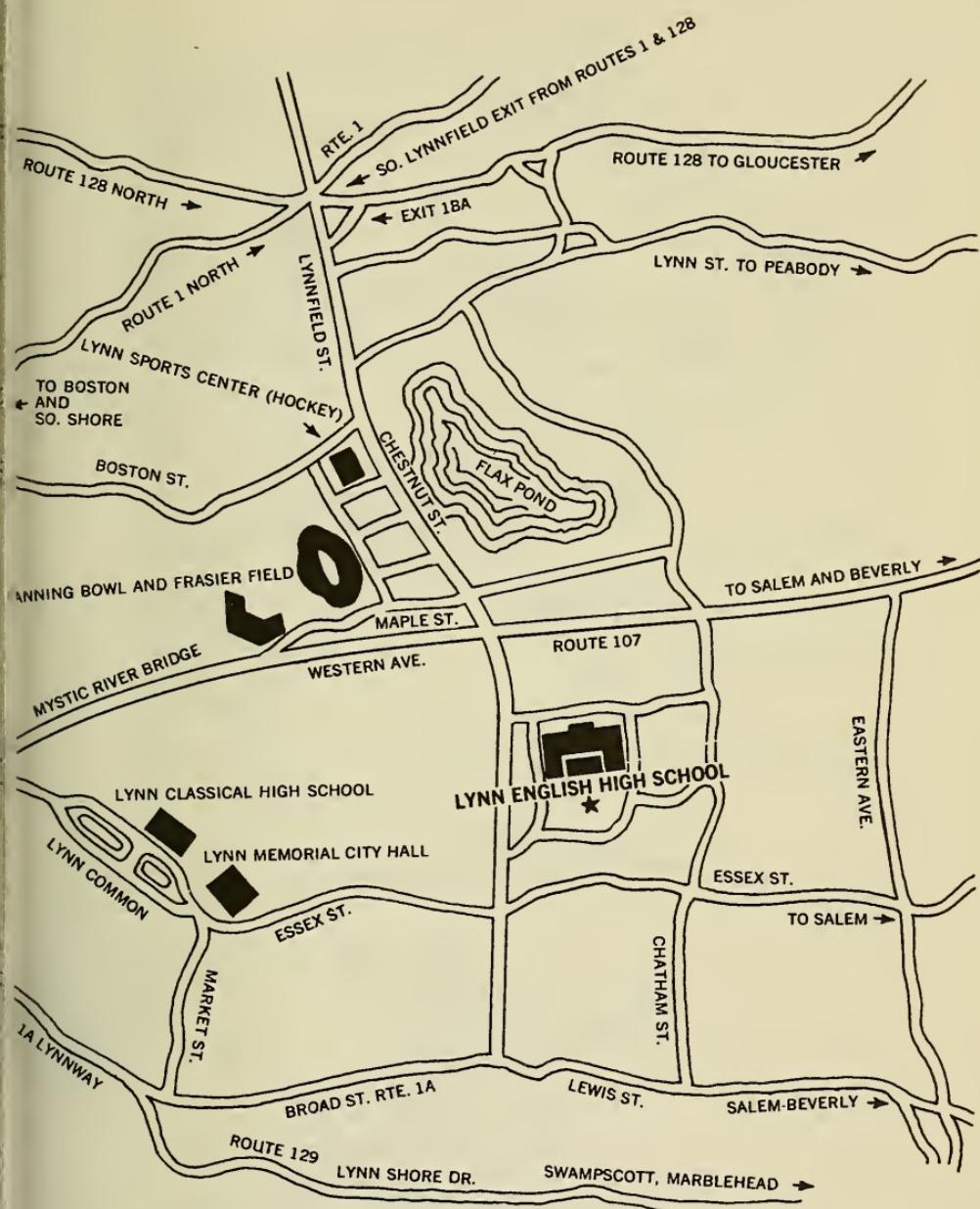
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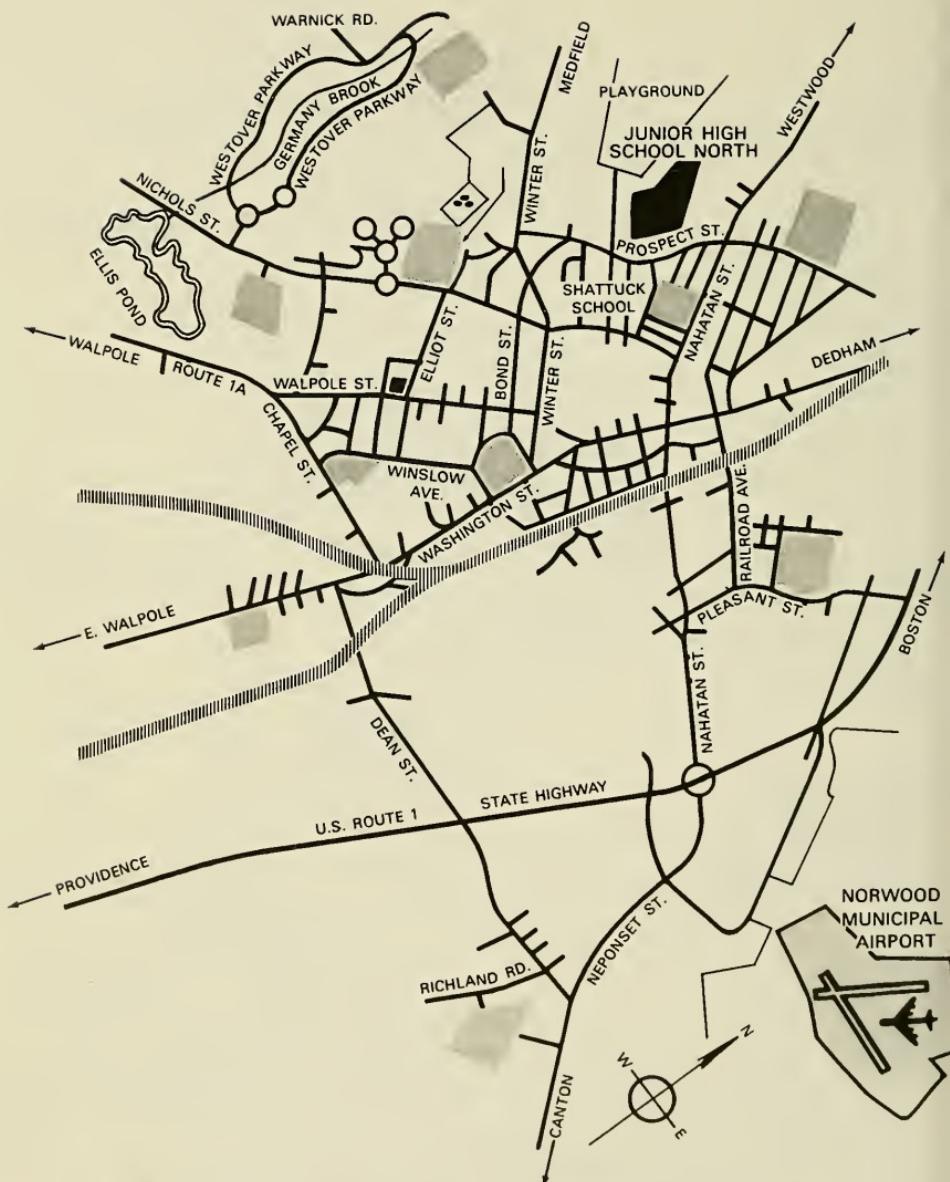
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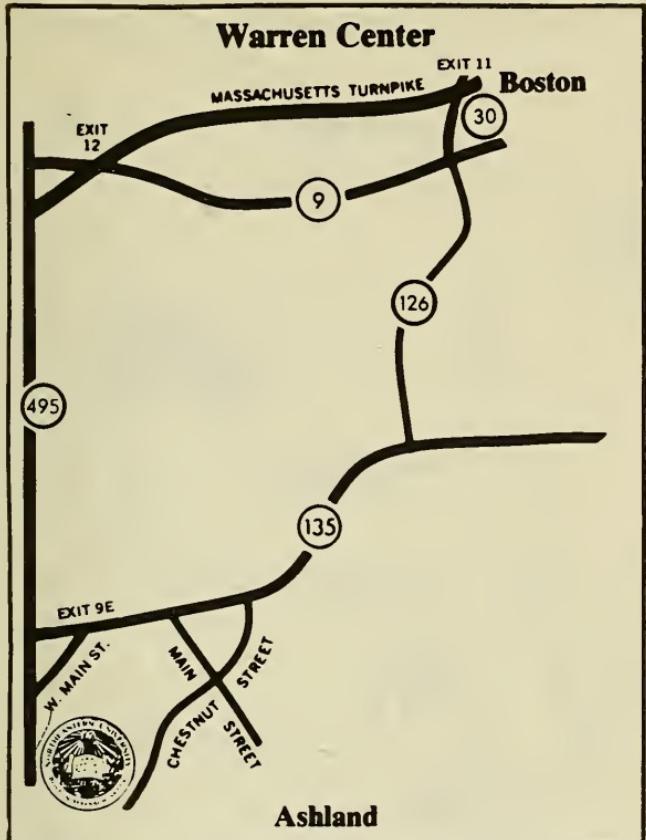


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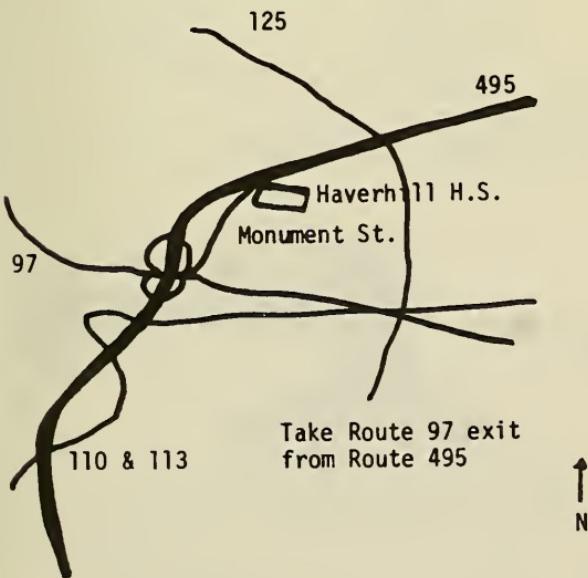


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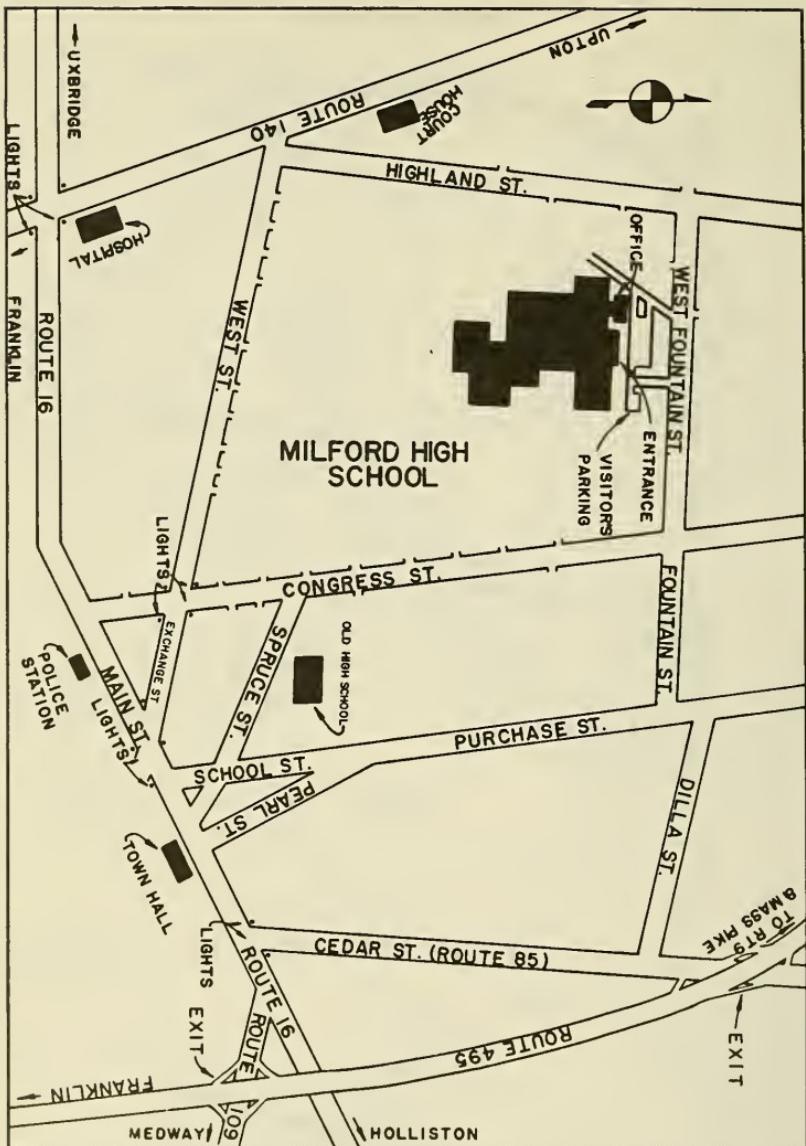




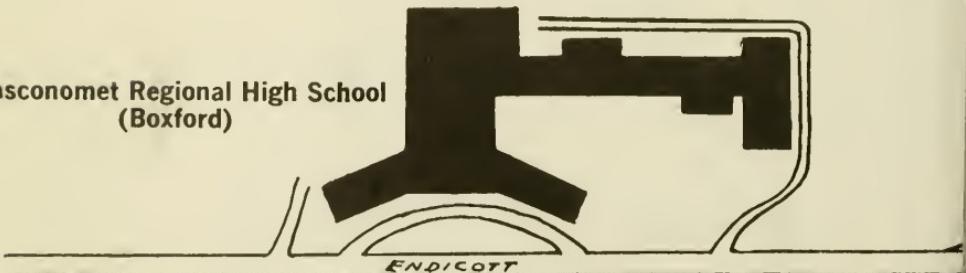
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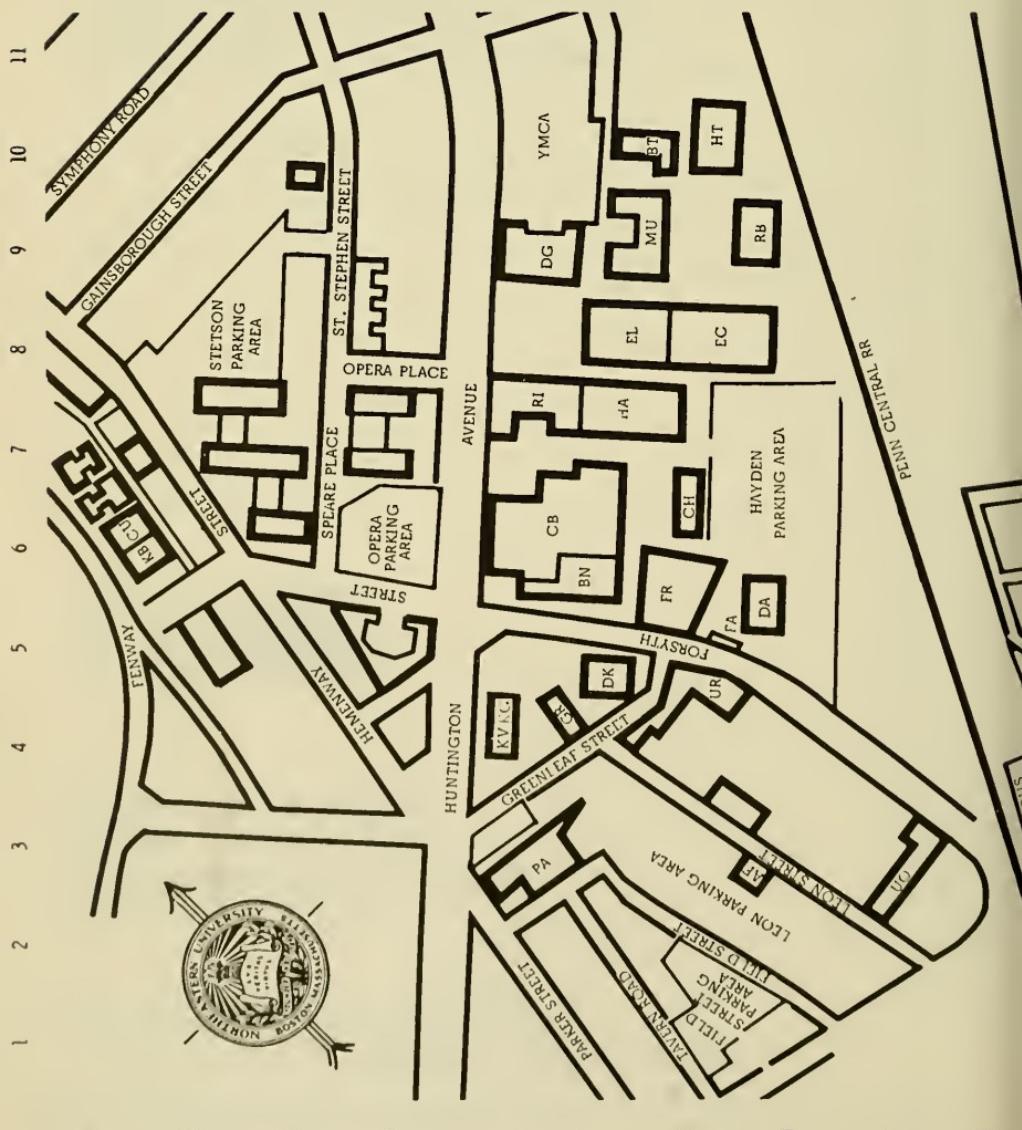
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Graduate School of Arts and Sciences 1974-76

<u>Building Designation</u>	
BN	Barletta Natatorium
BT	Botolph Building
CB	Cabot Physical Education Ctr.
CH	Churchill Hall
CU	Cushing Hall
DA	Dana Research Center
DK	Dockser Hall
DG	Dodge Library
EC	Elli Student Center and Alumni Auditorium
EL	Forsyth Building Annex
FR	Greenleaf Building
FA	Hayden Hall
GR	Hurtig Hall
KV	Kennedy Building
KG	Knowles Center (Gryzmish)
UO	11 Leon Street
AF	Afro-American Institute
MU	Mugar Life Sciences Building
PA	Parker Building
RI	Richards Hall
RB	Robinson Hall
UR	United Realty Building

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ACADEMIC CALENDAR 1974-1975

Fall Quarter 1974

Registration period		
Boston	Monday-Thursday	Sept. 23-26
Classes begin	Monday	Sept. 30
Examination period	Monday-Saturday	Dec. 16-21

Winter Quarter 1974-1975

Registration period		
Boston	Monday-Thursday	Dec. 9-12
Classes begin	Monday	Jan. 6
Examination period	Monday-Saturday	Mar. 24-29

Spring Quarter 1975

Registration period		
Boston	Monday-Thursday	Mar. 17-20
Classes begin	Monday	April 7
Last day to file commencement card for Spring Commencement	Tuesday	April 1
Last day to pay fee for Spring Commencement	Wednesday	April 30
Final grades due in Registrar's Office for June graduates taking third quarter course	Friday	June 6
Examination period	Monday-Saturday	June 16-21
Spring Commencement	Sunday	June 22

Summer Quarter 1975

Registration period		
Boston	Wednesday-Thursday	June 18-19
Classes begin	Monday	June 30
Last day to file commencement card for Fall Commencement	Tuesday	July 1
Last day to pay fee for Fall Commencement	Friday	August 1
Examination period	Wednesday-Saturday	Aug. 6-9

UNIVERSITY HOLIDAYS 1974-1975

Columbus Day	Monday	October 14
Veterans' Day	Monday	October 28
Thanksgiving Recess	Thursday-Saturday	Nov. 28-30
Christmas Vacation	Monday-Saturday	Dec. 23-Jan. 4
Washington's Birthday	Monday	February 17
Patriot's Day	Monday	April 21
Memorial Day	Monday	May 26
Independence Day	Friday	July 4
Labor Day	Monday	September 1

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1974-1975

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the university

Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under the General Laws of Massachusetts. The State Legislature by special enactment has given the University general degree-granting powers. The University is governed by a Board of Trustees elected by and from the Northeastern University Corporation, which is composed of nearly 180 distinguished business and professional men and women.

From its beginning, Northeastern University has had as its dominant purpose the discovery of community educational needs and the meeting of these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Cooperative Plan, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922), Liberal Arts (1935), Education (1953), Pharmacy (1962), Nursing (1964); Boston-Bouvé College (1964); the College of Criminal Justice (1967), and by Lincoln College's day Bachelor of Engineering Technology Programs (1971). This educational method enables students to gain valuable practical experience as an integral part of their college program and also provides the means by which they may contribute substantially to the financing of their education. The Plan has been extended to the graduate level in engineering, actuarial science, rehabilitation administration, professional accounting, business administration, and law.

In the field of adult education, programs of study have been developed to meet a variety of needs. University College offers evening courses — offered by the University since 1906 — and adult-day courses leading to the bachelor's degree. In addition to its day undergraduate programs in Electrical Engineering Technology and Mechanical Engineering Technology, Lincoln College offers evening/part-time certificate, associate, and bachelor degree programs in technological areas. All formal courses of study leading to degrees through part-time programs are approved by the Basic College faculties concerned.

GRADUATE AND PROFESSIONAL SCHOOLS

The ten graduate and professional schools of the University offer day and evening programs leading to the degrees listed:

The Graduate School of Actuarial Science offers the degree of Master of Science in Actuarial Science.

The Graduate School of Arts and Sciences offers the degrees of Master of Arts, Master of Science, Master of Science in Health Science, Master of Public Administration, and Doctor of Philosophy.

The Graduate School of Boston Bouvé College offers the degree of Master of Science, with specialization in Physical Education and Recreation Education.

The Graduate School of Business Administration offers the degree of Master of Business Administration.

The Graduate Program in Criminal Justice offers the degree of Master of Science.

The Graduate School of Education offers the degree of Master of Education and the Certificate of Advanced Graduate Study.

The Graduate School of Engineering offers the degrees of Master of Science, Engineer, Doctor of Philosophy, and Doctor of Engineering in Chemical Engineering.

The School of Law offers the degree of Juris Doctor.

The Graduate School of Pharmacy and Allied Health Professions offers the degrees of Master of Science and Doctor of Philosophy.

The Graduate School of Professional Accounting offers the degree of Master of Science in Accounting.

CENTER FOR CONTINUING EDUCATION

The Center for Continuing Education was established to relate the University to the needs of its community in a period of accelerated change. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. The Division of Special Programs, working cooperatively with trade associations and professional societies, offers a wide variety of programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

RESEARCH ACTIVITIES

The facilities of the University are engaged in a wide variety of basic research projects in business, science, social science, pharmacy, and engineering. These are conducted by the Dean of Research, whose services are University-wide and available to the faculties of all the Colleges.

Although Northeastern is primarily concerned with undergraduate and graduate instruction, the University believes that the most effective teaching and learning takes place in an environment characterized by research activities directed toward extending the frontiers of knowledge.

buildings and facilities

MAIN CAMPUS

The main campus of Northeastern University is located at 360 Huntington Avenue in the Back Bay section of Boston. Many of the city's famous cultural, educational, and philanthropic institutions are situated in the Back Bay, including the Museum of Fine Arts, Symphony Hall, Horticultural Hall, the Isabella Stewart Gardner Museum, the Harvard teaching hospitals, the Boston Public Library, and many schools and colleges. Most are within walking distance of Northeastern University.

Major transportation facilities serving the Boston area are Logan International Airport, two rail terminals, bus terminals serving inter- and intrastate lines, and MBTA subway-bus service within the metropolitan-suburban area. There is a subway stop in front of the campus. For motorists, the best routes to the campus are the Massachusetts Turnpike (Exit 22) and Route 9, of which Huntington Avenue is the intown section.

The campus of 48 acres is divided by Huntington Avenue, with the main educational buildings on one side and dormitories on the other. The principal buildings, all of which have been constructed since 1938, are of glazed brick in contemporary classic style. Most are interconnected by underground passageways.

libraries

The University library system consists of the Dodge Library, which is the main library; the Suburban Campus Library at Burlington; the School of Law Library; and three divisional libraries for Physics and Electrical Engineering, Chemistry and Biology, and Mathematics and Psychology, Physical and Recreation Education, and Physical Therapy. There are additional subject collections for the Center of Management Development at Andover, Massachusetts, and the Marine Science Institute at Nahant.

The library collections number 360,000 volumes supplemented by some 267,000 titles in microprint, microfilm, and microfiche forms. The collection includes, in addition, some 3,500 periodical titles, 90,000 documents, and 4,600 sound recordings.

Apartments for Graduate Students

The University maintains a 100-apartment housing unit which accommodates 279 people. Two-, three-, and four-party apartments are available which vary in size from two to four rooms plus bath. Apartments are furnished with beds, chairs, desks, stove, refrigerator, and kitchen table. The cost includes all utilities.

A \$50 deposit is required when making application for the apartment. Applications are available in the Office of University Housing. Students are expected to make such arrangements on a term-to-term basis but may live in the apartments both while on cooperative work assignments and in school if they wish. All reservations are made on a first come first served basis.

SUBURBAN FACILITIES

Suburban Campus

The Suburban Campus, located near the junction of Routes 128 and 3 in Burlington, Massachusetts, was established to meet the needs of individuals and of industry in the area.

In addition to graduate courses in engineering, business administration, science, education, and the arts, portions of undergraduate programs leading to the associate and bachelor's degrees, special programs for adults, and noncredit state-of-the-art programs are offered.

Marine Science Institute

The Marine Science Institute at Nahant, Massachusetts, is a research and instructional facility primarily engaged in studies of marine biology and oceanography. The Institute is operated all year, and is about 2 miles northeast of Boston. Many of the courses at the institute are applicable toward an advanced degree in biology or health science.

Government Center Campus

With the cooperation of the Federal Executive Board, the Department of Political Science offers an entire Master of Public Administration Program at the John F. Kennedy Building in downtown Boston. This program is primarily for individuals employed in federal, state, or local civil services.

the graduate school of arts and sciences

Thirty years ago the Department of Chemistry and the Department of Physics inaugurated the first graduate programs at Northeastern. In the succeeding years the creation of degree programs in other departments of the College of Liberal Arts led to the formation of the graduate program of arts and sciences in 1958 and finally the Graduate School of Arts and Sciences in 1963. Ten departments now offer work at the graduate level.

The Master of Arts degree may be earned in economics, English, history, political science, psychology, sociology, and social anthropology. The Master of Science degree is available in biology, chemistry, clinical chemistry, mathematics, and physics. The Master of Science in Health Science and the Master of Public Administration degrees are also offered. In addition, there are programs leading to the Doctor of Philosophy degree in biology, chemistry, economics, mathematics, physics, psychology, and sociology.

GENERAL REGULATIONS

The general regulations of the graduate school that follow are minimal requirements shared by the several degree programs. The student is advised to consult the appropriate departmental section for a statement of specific requirements.

Application

All applicants should address inquiries to the Director of the Graduate School of Arts and Sciences. Initial correspondence directed elsewhere may result in valuable time lost in initiating the admissions procedure. Application forms and reference blanks will be mailed to the applicant. This material, together with complete official transcripts, the Graduate Record Examination scores when required, and the results of the Test of English as a Foreign Language, required of all applicants whose native language is not English, should be returned to the Director of the Graduate School of Arts and Sciences. Applications for those desiring assistantships should be submitted no later than March 15, however.

some departments have earlier deadlines. Applications received after this date may not be given equal consideration. All necessary supporting documents must be on file with the graduate school office at least four weeks before the date of registration for the quarter in which the student expects to begin his scholastic program. For more detailed information see departmental requirements for admission.

All applicants to the graduate school are strongly urged to take both the aptitude and advanced portions of the Graduate Record Examination. These tests are presently required in biology, economics, English, history, mathematics, political science, psychology, and sociology and anthropology. At least two letters of recommendation are required of all candidates. In biology, physics, psychology, and sociology and anthropology, three letters are necessary. Candidates for financial awards should so indicate to those supplying references.

Applications for the Graduate Record Examination can be obtained by writing to:

Educational Testing Service
Box 955
Princeton, New Jersey 08540

Applications for the Test of English as a Foreign Language can be obtained by writing to:

Educational Testing Service
Box 899
Princeton, New Jersey 08540

Admission

To be enrolled for graduate work, an applicant must submit a complete official transcript indicating the award of a bachelor's degree from a recognized institution and provide evidence that he is able to pursue creditably a program of graduate study in his chosen field. His scholastic record must therefore show distinction, and his undergraduate program show breadth as well as adequate preparation in the field in which the applicant expects to do advanced work. Admission to the graduate school is for a specific academic quarter. Students who fail to attend must reapply if they wish to do course work in a subsequent quarter. Acceptance to the school is granted upon recommendation of the departmental graduate committee after a review of the completed application. Foreign students who do not receive a graduate award or whose award is insufficient to cover all educational and living expenses must certify that they are able to meet all their expenses while at Northeastern. A visa may not be granted without such certification.

Student Classifications

Regular Student Those students admitted with a bachelor's degree showing a high quality of previous work.

Provisional Student Students whose records do not qualify them for enrollment as regular students. Provisional students must obtain a B average in the first 12 quarter hours of study for continuation in the degree program.

Special Student Students not matriculated in a degree program. Acceptance as a special student is in no way related to admission into a departmental degree program. However, those special students subsequently admitted into a degree program may apply the first twelve quarter hours of credit earned as a special student toward degree requirements. Special students are expected to maintain a B average in the first 12 quarter hours of study.

Doctoral Student Students admitted to a doctoral program.

Doctoral Degree Candidate Doctoral students who have completed 40 quarter hours of acceptable graduate work and have passed the qualifying examination.

Registration

Students must register within the dates and times listed on the school calendar. The place of registration will be announced prior to each period.

Residence

All work for advanced degrees must be registered for and completed at the University unless approval has been obtained from the director of the graduate school for work taken elsewhere.

Programs of Study

The study load for full-time students is usually four courses per quarter. Part-time students are limited to two courses per quarter unless permission to carry a heavier load is given by the departmental chairman or his designate. Courses in most fields are offered both in the afternoon and evening.

Grading System

The performance of students in graduate courses will be recorded by the instructor by use of the following grades:

A Excellent

This grade is given to those students whose performance in the course has been of very high graduate caliber.

B Satisfactory

This grade is given to those students whose performance in the course has been at a satisfactory level.

C Fair

This grade is given to those students whose performance in the course is not at the level expected in graduate work.

F Failure

This grade is given to those students whose performance in the course is unsatisfactory.

In addition, the following letter designations are used:

I Incomplete without quality designation.

This grade may be given to those students who fail to complete the work of the course.

L Audit without credit.

S Satisfactory without quality designation.

U Unsatisfactory without quality designation.

An S or U grade is used for the first quarter of a two-quarter sequence in which the grade for the second quarter applies to both the first and second quarters of the sequence.

The I grade will be changed to a letter grade when the deficiency which led to the I is made up to the satisfaction of and in the manner prescribed by the instructor in the course, or, in his absence, by the chairman of the department in which the grade is given. The period for clearing such a grade will be restricted to one calendar year from the date of its first being recorded on the student's permanent record.

Students must indicate their preference for auditing a course at registration. No credit will be given for the course. It will, however, appear on the student's transcript. Registration changes from an audit to a graded status, or vice versa, may only be made prior to the first day of classes.

Class Hours and Credits

All credits are entered as quarter hours. A quarter hour of credit is equivalent to three-fourths of a semester hour credit.

Continuity of Program

Students are expected to maintain continuous progress toward a degree. Any student who does not attend Northeastern for a period of one year must apply for readmission.

Withdrawals

In order to withdraw from a course, a student must fill out an official withdrawal form obtained at the Registrar's Office or at the Suburban Campus Office. Withdrawals may be made through the ninth week of the quarter. Students will be withdrawn as of the date on which they file.

it the form. Ceasing to attend a class or notifying the instructor does not constitute an official withdrawal.

Changes in Requirements

The continuing development of the graduate school forces frequent revision of curricula. In every new bulletin some improvements are indicated. When no hardship is imposed on the student because of changes, and when the facilities of the school permit, the student is expected to meet the requirements of the latest bulletin. If the student finds it impossible to meet these requirements, the bulletin for the year in which he entered becomes the binding one.

Application for the Diploma

If a commencement card is not filed with the Registrar's Office on or before the applicable date listed in the calendar, there is no assurance that the degree will be granted in that particular year even though all other requirements have been fulfilled.

THE MASTER'S DEGREE

mission

Specific requirements for each degree program will be found in the appropriate paragraphs for each department.

Academic Requirements

A candidate for the master's degree must complete a minimum of 40 quarter hours of correlated work of graduate caliber and such other study as may be required by the department in which he is registered.

During the first half of the total number of hours of course work required for the degree, the candidate will be expected to maintain a minimum quality point average of 2.5. At the completion of three-fourths of the total number of hours of course work required for the degree, the candidate will be expected to have a quality point average of 2.8. To qualify for the degree, a final average of 3.0, equivalent to a grade B, must be obtained. This average will be calculated quarterly by the Graduate School on the basis of A = 4, B = 3, C = 2, and F = 0 and will exclude any transfer credits.

Not more than six quarter hours of repeated courses, additional courses, or permanent I's may be allowed in order to satisfy the requirements for the degree.

Within the above limitations, a required course for which a grade of D is received must be repeated with a grade of C or better, and may be repeated only once. If a grade of F is received in an elective course, the course may be repeated once to obtain a grade of C or better, or

another elective course may be substituted for it. If a grade of C received in a required course, that course may be repeated once obtain a grade of B or better.

Comprehensive Examination

A final written or oral comprehensive examination may be require. This examination will be given at least two weeks before the commencement at which the degree is expected.

Thesis

A thesis must show independent work based on original material, t approved by the departmental graduate committee, and must receiv a grade of B or better to be accepted.

Language Requirement

An examination to show evidence of ability in one or more foreign languages is required in some graduate programs. This knowledge established by an examination which will be administered by the graduate school at least twice yearly.

Transfer Credit

A maximum of 12 quarter hours of credit obtained at another institution may be accepted toward the master's degree provided th the credits transferred consist of A or B grades in graduate lev courses, be in the candidate's field, have been earned at a recognize institution, and have not been used toward any other degree. Studen should petition the director of the graduate school in writing for a transfer credit. Transfer credit grades may not be used for the purpos of obtaining the academic average necessary for the completion of th degree requirements.

Time Limitation

Course credits earned in the program of graduate study, or accepte by transfer, are valid for a maximum of seven years unless an extensio is granted by the Committee of the Graduate School of Arts and Sciences.

THE DOCTOR OF PHILOSOPHY DEGREE

The Doctor of Philosophy degree is awarded to candidates who gi evidence of high attainment and research ability in their major fie The degree requirements are administered by committees in charge each degree program. These committees may be departmental graduua

committees or the committee of the graduate school depending upon the nature of the program. It is the responsibility of the chairman of the committee to certify to the Graduate School Office the completion of each requirement for each candidate.

Admission

Each degree program has an established admission procedure for students starting their doctoral work at Northeastern University.

Residence Requirement

Candidates for the Doctor of Philosophy degree must spend the equivalent of at least one academic year in residence at the University as a full-time graduate student. The committee of each degree program specifies the method by which the residence requirement is satisfied.

Qualifying Examination

Students must pass a qualifying examination within time limits set by the committee of each degree program.

Comprehensive Examination

Degree programs may require a comprehensive examination during the time in which a student is a degree candidate.

Course Requirements

The minimum course requirement of 40 quarter hours constitutes the work normally required for a master's degree. The course requirements beyond this in each doctoral program are specified by the committee in charge of the doctoral program.

Dissertation

Each doctoral student must complete a dissertation which embodies the results of extended research and makes an original contribution to the field. This work should give evidence of the candidate's ability to carry out independent investigation and interpret in a logical manner the results of the research. The method of approval of the dissertation is established by the committee in charge of the degree program.

Language Requirement

The foreign language requirement is established by the committee in charge of each degree program.

Final Oral Examination

The final oral examination will be on the subject matter of the doctoral dissertation and significant developments in the field of the

dissertation. Other fields may be included if recommended by the examining committee.

This examination will be taken after completion of all other requirements of the degree and must be held at least two weeks prior to the commencement at which the degree is to be awarded.

Transfer Credit

Approval for transfer credit may be given by the committee in charge of the degree program.

Time Limitation

After the establishment of degree candidacy, a maximum of five years will be allowed for the completion of the degree requirements.

Registration

All students must register for course work or dissertation as approved by their advisers or the departmental registration officer. After the first registration for doctoral work, registration must be continuous unless withdrawal is allowed by the committee in charge of the degree program. Students must be registered for dissertation during the quarter in which they take the final oral examination.

INTERDISCIPLINARY PROGRAMS

Some graduate students may wish to pursue doctoral programs which involve substantial work in two or more departments. To meet this need an interdisciplinary program may be established which corresponds in scope and depth to doctoral standards, but does not agree exactly with the individual departmental regulations. For such possibilities, the following option is available:

Admission

Application for admission to interdisciplinary doctoral study consists of the submission of a carefully thought-out written proposal describing the areas of proposed study and research. The proposal may be a part of the initial application for admission to graduate study at Northeastern University, or it may be submitted by a student already enrolled. It may be directed to a doctoral degree-granting department or to the director of the graduate school who forwards it to the appropriate department. In either case, admission to interdisciplinary doctoral study requires favorable recommendation by the sponsoring doctoral degree-granting department and approval by authorized representatives of the graduate study committees of the departments appropriate to the disciplines covered by the applicant's proposal. The sponsoring department becomes the registration base of the student.

Formation of Interdisciplinary Committee

A student who has been accepted for interdisciplinary study must obtain the consent of an adviser who will direct his doctoral dissertation. This adviser, who may or may not be a member of the registration department, will be chairman of the interdisciplinary committee for this student. A second member will be appointed from the registration department by its chairman. These two members will obtain one or more additional members or request the director of the graduate school to do so. At least two departments must be represented on the committee and a majority of the committee must come from doctoral degree-granting departments. The chairman of the registration department will notify the rector of the graduate school of the membership of the committee as soon as arrangements are complete.

Duties of Interdisciplinary Committee

A member of the interdisciplinary committee who is also a member of the registration department will serve as the registration officer to approve the course registration for the student. A copy of the approved course registration must also be filed with the other committee members and with the graduate study committee of the registration department.

The interdisciplinary committee will be responsible for the administration of the qualifying examination, language examination, approval of the dissertation, and comprehensive examination. This committee must also certify to the registration department the completion of the requirements for the award of the doctoral degree.

The interdisciplinary committee must assure that the program of the student represents standards comparable to those of the registration department and that the program is not so broad that it has inadequate depth in any area.

The program of the student may be reviewed at any time by the rector of the graduate school to determine whether objectives of the program are being met.

Equal Opportunity Policy

Northeastern University is committed to a policy of providing equal opportunity for all. In all matters involving admission, registration, and all official relationships with students, including evaluation of academic performance, the University insists on a policy of nondiscrimination. Northeastern University is also an equal opportunity employer; it is institutional policy that there shall not be any discrimination against any employee or applicant for employment because of race, color, religion, sex, age or national origin. In addition, Northeastern takes affirmative action in the recruitment of students and employees.

financial information

FINANCIAL OBLIGATIONS

Tuition

Master's Degree Candidates

The tuition rate for 1974-1975 is \$57 per quarter hour of credit.

Doctoral Candidates

Tuition for full-time doctoral candidates in 1974-1975 is \$57 per quarter hour of credit. Doctoral candidates actively utilizing the resources of the university in their Ph.D. dissertation are charged an additional \$60 per quarter. Those doctoral candidates registered for dissertation work performed off campus are charged \$200 in addition to tuition charge each quarter, and those doctoral candidates who are no longer actively utilizing university resources are charged a continuation fee of \$50 per quarter.

Tuition statements are mailed to students by the Bursar's Office and are payable by check to Northeastern University.

Fees

An application fee of \$15 is charged all students when they apply for the first time in the graduate school at Northeastern.

Other fees include a charge of \$10 for late payment of tuition; a fee of \$25 for all degree candidates, payable before commencement by the applicable date listed on the academic calendar.

For full-time students there is a charge of \$12.50 per quarter for the services available in the Student Center. The fee for teaching assistant and research fellows is \$6.25 each quarter. All part-time students on the Huntington Avenue campus are charged \$.75 a quarter.

All full-time students will pay a nonrefundable University health services fee of \$90 each year. This fee will provide Blue Cross-Blue Shield coverage and entitle the student to the medical care furnished by the University Health Services. Tuition and fees are subject to change without notice.

All financial obligations to the University must be discharged by aduation.

Refunds

Tuition refunds will be granted only on the basis of the date appearing on the official withdrawal form filed by the student. Nonattendance does not constitute official withdrawal. Questions regarding refunds should be discussed with the Bursar's Office.

Refunds will be granted in accordance with the following schedule:

Official Withdrawal Filed Within	Amount of Refund	Percentage of Tuition
First week of quarter	100	
Second week of quarter	75	
Third week of quarter	50	
Fourth week of quarter	25	

FINANCIAL AID

Northeastern University has available fellowships and assistantships for full-time students who are working toward the master's or doctor's degree. Candidacy for these awards may be established by completing the relevant section of the application for admission. Those students already enrolled should consult their departmental adviser.

Teaching Assistantships

Teaching assistantships allowing remission of tuition and a stipend are available in all departments. Holders of such awards devote half time to academic assistance directly related to the teaching function and the balance to course work.

Graduate Administrative Assistantships

Some University departments offer the graduate student an opportunity for remission of tuition and a stipend in return for half time spent assisting with nonteaching, administrative duties.

Student Assistantships

Many departments provide remission of tuition to full-time students assisting eight hours a week in the administrative work of the department. These awards are normally given to students in the first year of graduate work.

Research Fellowships

A number of departments offer research fellowships including N.I.H., S.F., and N.D.E.A. carrying a stipend and remitting tuition. Certain of these grants require half-time work on research in the department,

with the remaining time devoted to course work. Others provide for full-time work on research used for a thesis or dissertation.

Martin Luther King, Jr., Scholarships

A limited number of full- and part-time Martin Luther King, Jr., Fellowships are available. These scholarships provide for remission of tuition and all fees, and are awarded to qualified black students on the basis of financial need. Additional information and application forms are available from the Office of Financial Aid.

Robert A. Feer Scholarship

This scholarship is awarded yearly to the outstanding candidate for the Master of Arts degree in History. The scholarship was established in memory of Professor Robert A. Feer who was a member of the Department of History from 1963 to 1970.

Appointments

Appointments to fellowships and assistantships are ordinarily announced no later than April 15 for the following academic year summer. Appointments are for a maximum of three quarters and are not automatically renewed. Students who hold assistantships and research fellowships are expected to devote full time to their studies and the duties of the award. They may not accept outside employment without the consent of their faculty adviser and the director of the graduate school.

Dormitory Proctorships

A number of proctorships for men in dormitories on or near the Huntington Avenue campus are available each year. Appointments carry minimum compensation of room and board. Further information and application forms may be obtained from the Office of University Housing.

National Direct Student Loan

This program is available to students who are carrying at least one half the normal academic work load, are accepted as degree candidates and who show evidence of financial need.

The Federal maximum which a graduate student may borrow while pursuing a post-baccalaureate degree is \$5,000.

Repayment and interest on these loans do not begin until nine months after the student ceases to carry at least a half-time academic load at an institution of higher education. The repayment of principal may be extended over a 10-year period with the interest at the rate of three percent per annum. Repayment may be deferred up to a total of three years while a borrower is serving as a Peace Corps or VISTA volunteer.

Guaranteed Student Loan Program

Under this program, students who are matriculated degree candidates, enrolled for at least one-half the normal academic work load, may borrow from a participating bank or other financial institution. Terms and conditions vary from state to state, but a student generally may borrow up to \$1,500 a year (the law allows a maximum of \$2,500 per year) depending on financial need. The Federal government pays the interest while the student is in school if the student is eligible for interest subsidy. The student must have submitted, through the College Scholarship Service, a Parents' Confidential Statement; or if he has been declared financially independent by the Financial Aid Office, a Students' Confidential Statement. These forms are available in the Financial Aid Office. Applications for the loan itself are available from local banks or the Education Office of your state government. Additional information and necessary application forms for Massachusetts residents are available from the Financial Aid Office.

The federal aid programs listed above are available to citizens and permanent residents of the United States.

Fields of study

The departmental sections that follow list courses available to a student during the typical period of attendance required to obtain a degree. The quarter in which a specific course will be offered will be indicated in the course announcement made available in May for the summer quarter and in June for the following academic year.

biology

Professors

Francis D. Crisley, Ph.D.,
Chairman
Charles Gainor, Ph.D.
Abdul-Karim Khudairi, Ph.D.
John F. Reinhard, Ph.D.
Nathan W. Riser, Ph.D., Director,
Marine Science Institute

Associate Professors

Charles H. Ellis, Jr., Ph.D.
Janis Z. Gabliks, D.D.S., Ph.D.
Charles A. Meszoely, Ph.D.
M. Patricia Morse, Ph.D.
Joseph V. Pearincott, Ph.D.
Fred A. Rosenberg, Ph.D.
Ernest Ruber, Ph.D.
Brunhild I. E. Stuerckow, Dr.
rer. nat.
Henry O. Werntz, Ph.D.

Assistant Professors

Troy L. Best, Ph.D.
Harvey S. Bialy, Ph.D.
Helen Lambert, Ph.D.
Dale F. Levering, Jr., Ph.D.
Daniel Scheirgr, Ph.D.
Phyllis R. Strauss, Ph.D.

THE MASTER OF SCIENCE DEGREE Full-Time Program

THE MASTER OF SCIENCE IN HEALTH SCIENCE DEGREE Part-Time Program

Admission

In addition to the requirements listed on page 20 applicants should have a background which includes one year of organic chemistry, physics, and mathematics and six quarter courses of the biology undergraduate core curriculum or its equivalent. Students admitted with deficiencies should remove them during the first 20 quarter hours of graduate work.

Program

Forty-six quarter hours of academic work are required. A candidate for either degree is expected to take forty hours of course work including four hours of seminar, and one laboratory course in microbiology unless previously taken elsewhere. Transfer credits will be accepted only from those schools offering graduate programs in biology. Application for such credit should be made in writing to the director of the graduate school during the first quarter following the student's assignment to an academic adviser. Other limitations on transfer credit are

sted on page 26 Graduate courses in departments other than Biology will be accepted for credit up to a limit of 12 quarter hours, including those credits previously accepted as transfer credits, upon written recommendation from the student's adviser to the graduate director or final approval.

During his tenure, in addition to the above course requirements, each student pursuing work toward the master of science degree in the full-time program must enroll for a minimum of six credits of work in 18.990, Special Topics in Biology, or 18.991, Research for the Master of Science degree. After initial election of either 18.990 or 18.991 the student must register for either of these courses for each quarter until the work is completed. Work in 18.990, Special Topics in Biology, is pursued under the supervision of an individual faculty member, by mutual agreement. It may take the form of a comprehensive, critical review of the literature in specialized area and/or a specific program of experimental work on a single topic. If experimental work has been elected under 18.990 it may later be expanded, with permission of the departmental graduate committee, into a master's thesis with a topic and adviser and a committee of three members approved by the departmental graduate committee. Grades in 18.990 or 18.991 are recorded as "Satisfactory" until all work is completed, culminating in either a comprehensive, well-written report — which must be reviewed by the department graduate committee — or a thesis. A comprehensive examination in the last six months of the master's program is required of all students, except those presenting a thesis. For the latter a final oral examination on the thesis is required. The department encourages the pursuit of a thesis wherever feasible.

The program leading to the Master of Science in Health Science degree is designed for part-time students who may progress according to their abilities, the time available, and the need or desire to extend their education into interdisciplinary work involving biology or allied areas such as the health sciences. Students may elect to substitute six quarter hours of course work credit for the required 18.990, Special Topics in Biology or 18.991, M.S. Thesis. Those students electing the course option must take a comprehensive examination in the last six-month period of their program, similar to the examination required of students pursuing Special Topics work. With the permission of the departmental graduate committee the two master's degree programs are interchangeable. If their schedules permit, students in the M.S. in Health Science program may carry out their work on a full-time basis.

THE DOCTOR OF PHILOSOPHY PROGRAM

admission

Applicants who will have a master's degree or its equivalent at entry may be considered for direct admission to the doctoral program. Those

who will not may be considered only for admission to the master program, and, after satisfactory completion of 30 quarter hours of graduate study, may then be considered for admission to the doctor program.

Residence Requirement

After he has been admitted to the doctoral program, the student must satisfy the residence requirement by one year of full-time graduate work or by two years of half-time graduate work. However, a student should expect to spend at least two years or the equivalent in full-time study.

Degree Candidacy

Degree candidacy is established in accordance with the general graduate school regulations.

Qualifying Examination

Students entering the doctoral program will be expected to have had the equivalent of an M.S. degree at Northeastern before taking the qualifying examination. Students who have been accepted into the doctoral program will normally be expected to complete the qualifying examination by the end of three quarters at Northeastern University a time specified by the departmental graduate committee. The candidate will be expected to demonstrate an advanced knowledge of biological concepts. The examination will be oral and approximately two hours in duration. Eligibility to continue in the program toward the Doctor of Philosophy degree is contingent upon satisfactory performance on the qualifying examination.

Comprehensive Examination

The comprehensive examination requirement will be fulfilled by two written examinations, one in the major area of specialization and the other in closely related areas. The candidate may apply through his adviser after completing the foreign language requirement and at least one quarter prior to the oral examination.

Course Requirements

After the establishment of candidacy, any further course requirements will be established by the dissertation adviser and approved by the departmental graduate committee.

Dissertation

In most cases, arrangements for the dissertation director will have been made before the completion of the qualifying examination. If no such arrangements must be made as soon as possible after degree

andidacy has been established. The dissertation director advises the candidate on the research for the dissertation, which is to be performed in accordance with general graduate school regulations. He serves as chairman of the dissertation committee, which must approve the dissertation before the degree may be conferred. The doctoral committee shall consist of at least five members.

Language Requirement

Ability to read and translate biological literature in one foreign language must be established by the candidate. In order to maximize the usefulness of this language as a tool of research, the student should take the language examination as early as possible. The examination will be administered by the Department of Biology, or in certain cases, by the Modern Language Department. French, German, and Russian are the three most important foreign languages for the biologist. Students will be expected to choose one of these languages for their examination, but another language may be substituted where there is significant literature in the area of interest.

Tool of Research

A tool of research is required in addition to the above language. This requirement may be fulfilled through either passing a second foreign language examination in a language in which there is significant literature, or completion of a program in the general principles of statistics, biometry, and/or computer programming.

Final Oral Examination

This examination will be held in accordance with the general regulations of the graduate school.

INTERDISCIPLINARY PROGRAMS

Admission

Application and credentials for admission to interdisciplinary programs involving the Biology Department, where this department is clearly the department of registry, as described under "General Regulations," should be submitted as described under the heading of "Admission" in the section "The Doctor of Philosophy Program" for biology. The interdisciplinary committee will consist of at least five members. The composition of this committee will be determined by mutual consent between the departments involved, but will have at least three members from the Biology Department if the dissertation adviser is from this department. Upon admission, suitable interdisciplinary course requirements will be determined by the interdisciplinary committee.

Qualifying Examination

Students accepted into the program will normally be expected to complete the qualifying examination by the end of three quarters at North-eastern University. At least five areas of study will be covered by the qualifying examination, at least three of which will be oral examinations chosen by the candidate from the following areas: biochemistry, botany ecology, genetics, microbiology, physiology, and zoology. The remaining components of the examination will be specified and evaluated by the other participating department. With the exceptions of the procedures for admission and examinations for qualification, the remaining requirements and procedures are as specified under "The Doctor of Philosophy Program" for biology.

DESCRIPTION OF COURSES

All courses carry four quarter hours of credit unless otherwise specified.

18.803 Biometrics

Statistical methods applied to biological samples and analysis of biological research data. *Prep. Algebra*

18.804 Lower Invertebrates

Taxonomy, morphology, embryology, and life histories of acelomate phyla (Marine Science Institute).

18.805 Coelomate Invertebrates

Biology of annelida, arthropoda, mollusca, and echinodermata (Marine Science Institute).

18.806 Malacology

Functional morphology, embryology, systematics, and ecology of the major groups of mollusks. *Prep. Invertebrate Zoology.*

18.808 Vertebrate Zoology (5 q.h.)

Evolution, phylogeny, anatomy, physiology, behavior, population dynamics, reproduction, etc., of the vertebrates. Field collection, preparation, and study of local vertebrates will be carried out in the laboratory. *Prep. Comparative Anatomy or Embryology.*

18.809 Mammalogy (5 q.h.)

Phylogeny, anatomy, physiology, behavior, reproduction, population dynamics and natural history of the mammals. The course will include student presentation of the recent advances in mammalogy. Field collection and laboratory preparation and study of specimens will be included. *Prep. Comparative Anatomy or Embryology.*

18.810 Ichthyology

Natural history and systematics of fishes, with emphasis on marine species (Marine Science Institute).

3.813 Dynamics of Aquatic Ecology I (3 q.h.)

Chemical, physical and biotic factors influencing coastal and lake communities. Lectures. *Prep. 18.134 or 18.834 or equivalent.*

3.814 Dynamics of Aquatic Ecology II (3 q.h.)

One hour of lecture and one full day (7 hours) of laboratory-field work. *Prep. 3.813.*

3.815 Biological Factors in Ocean Engineering (2 q.h.)

Natural biological phenomena and their relationship with man-made alterations in the sea. *Prep. Registration in a graduate engineering program.*

3.818 Ecology of Salt Marshes (3 q.h.)

Survey of fauna and flora, environmental factors affecting them and current biological and social problems associated with this habitat. This course will meet for 2 lectures of 1½ hours each and 1 full day of laboratory for 6 weeks during the summer quarter. *Prep. A basic ecology course or consent of the instructor.*

3.819 Principles of Systematics (3 q.h.)

Principles of nomenclature. Biological principles basic to methodology of the preparation of monographs and of faunas and floras.

3.823 Human Ecology

Parameters of the human ecological niche, man's effect on them, and their consequences for him. *Prep. Basic Ecology or consent of instructor.*

3.825 Plant Nutrition and Metabolism

General nutrition, photosynthesis, metabolic pathways, and translocation in higher plants.

3.826 Plant Growth and Reproduction

Plant hormones, growth, development, and physiology of reproduction. *Prep. 18.825.*

3.827 Physiology of Plant Growth and Development (2 q.h.)

General coverage of the internal and environmental factors that influence the physiology of plant growth and development. The mechanisms by which plant growth hormones regulate the physiology of plants will be discussed with particular emphasis on the roles of auxins, gibberellins, cytokinins, and phytochrome. *Alternates yearly with 18.833.*

3.829 Fossil Plants (3 q.h.)

Fossil forms from past times.

3.830 Marine Algae

Systematics, life histories, and ecology of marine algae, with emphasis on the flora of the Gulf of Maine (Marine Science Institute).

3.831 Plant Morphogenesis I

A study of the continually unfolding series of changes in the life of the plant. The origin of form, experimentally controlled development, and external and internal factors that govern development of form. *Prep. 18.137, 18.234.*

18.832 Plant Morphogenesis II

Plant tissue, organ, and cell culture techniques employed in the study of morphogenetic processes. *Prep. 18.831.*

18.833 Photosynthesis (2 q.h.)

A general discussion of the biochemistry and physiology of photosynthesis with particular emphasis on recent discoveries in electron transport, chloroplast structure, and CO₂ assimilation. The evolution and requirements of photosynthesis will also be discussed. *Prep. 18.827. Alternates yearly with 18.827.*

18.834 Environmental and Population Biology (2 q.h.)

Physico-chemical factors influencing and influenced by organisms. Interaction among individual organisms and among species. Students will participate in lectures and laboratories given for 18.134. Individual work on specialized aspects of ecology will be assigned. *Prep. One year of General Biology including plant and animal biology.*

18.836 Cardiovascular Physiology (3 q.h.)

Physiology of blood cells, anemia, polycythemia immunity and allergy. Electro physiology of the heart, cardiac cycle, EKG, hemodynamics, capillary dynamics pulmonary circulation, cardiovascular reflexes, cardiac output and venous return Cardiac failure, coronary circulation, atherosclerosis, hypertension, cerebro circulation, circulatory shock.

18.837 Cardiovascular Physiology Laboratory (1 q.h.)

Three hours of laboratory study per week. *Prep. 18.836.*

18.838 Animal Nutrition (2 q.h.)

Detailed consideration of organic and inorganic nutritional requirements of man and selected animals. Digestion, absorption, and metabolism of nutrient materials. Role of vitamins, minerals, and trace elements in metabolism. Variation in nutritional needs among normal individuals and in various physiological and genetic pathologies. Evaluation of food additives and of permissible level of toxic materials in food.

18.840 Comparative Physiology of Regulatory Mechanisms (2 q.h.)

Principles and selected examples of physiological response to environmental variation. *Prep. Basic Physiology.*

18.842 Vertebrate Endocrinology (2 q.h.)

Principles of hormonal regulation of physiological processes in vertebrates; mechanisms of hormone action, neuro-endocrine relationships. *Prep. Physiology.*

18.843 Procedures in Endocrinology (3 q.h.)

Laboratory techniques used in the study of endocrine activity in vertebrates. *Prep. 18.842.*

18.845 Physiological Ecology (2 q.h.)

Study of biological and chemical mechanisms involved in adaptation; homeostasis and its regulation, salt and water metabolism; respiratory and circulatory control systems; adaptation versus acclimation. Control systems within the body versus set points. *Prep. College Biology, Organic Chemistry.*

3.846 Nuclear and Radiobiology (2 q.h.)

Interaction of radiation and biological matter; isotopic tracer techniques; isotopes and biochemical reactions, radiation ecology, activation analysis and its application in biological and forensic sciences. *Prep. College Biology, Organic chemistry.*

3.847 Scientific and Legal Interactions of Environmental Management (2 q.h.)

The kinds of scientific information required for implementation of the legal and political aspects of environmental management. The role of the scientist as an expert witness. Scientific and legal predictability. Analyses of suitable dynamic models and case law with the goal of improving the results of legal, political, and scientific decisions bearing upon remedial environmental management. *Prep. Biology core and first course in physiology, e.g., 18.158 and 18.159.*

3.852 Advanced Developmental Biology (3 q.h.)

Analysis of development at the biochemical and cellular levels. Nucleic acid and protein synthesis, gene action and differentiation, cell-cell interactions, mechanisms of animal morphogenesis. 3 hrs. of lecture. *Prep. 18.135, 18.136 or consent of the instructor.*

3.853 Advanced Developmental Biology Laboratory (2 q.h.)

Analysis of the fundamental problems of development through experimental techniques. Culture of vertebrate and invertebrate embryos; microsurgical analysis of morphogenesis; biochemistry of development, cell-cell interactions; organ and tissue culture will be studied. 5 hours of laboratory per week. *Prep. 18.852 or consent of the instructor.*

3.857 Advanced Mammalian Physiology (4 q.h.)

Extensive study of the physiological systems of mammals. For students with previous background in physiology. *Prep. Consent of the instructor.*

3.858 Advanced Mammalian Physiology Lab (3 q.h.)

Experimental study of the circulatory, respiratory, digestive, excretory, reproductive, nervous, and endocrine systems in mammals, with emphasis on laboratory procedures and surgical techniques used with living animals — chiefly, the dog. *Prep. 18.857 or consent of the instructor.*

3.860, 18.861 Cell Biophysics and Biochemistry I, II (5 q.h.)

Biogenesis and ultrastructure of the cell considered together with the biophysical procedures and biochemical patterns used in the study of cellular and tissue components. *Prep. Organic Chemistry and General Biology.*

3.863 Neurophysiology (2 q.h.)

The biophysical function of nerve cells including the resting potential energy, the reception and transmission of stimuli, and the coding of neuronal signals.

3.864 Neurophysiology Laboratory (2 q.h.)

Introduction into neurophysiological methods. *Prep. 18.863 (may be taken concurrently).*

3.870 Tropical Field Studies (1 q.h. per week)

Field work under direct supervision of faculty.

18.871 Evolution (3 q.h.)

Current concepts and selected examples of the process and results of evolution. The modern synthesis draws upon biochemical, physiological and genetic evidence as well as classic morphological and biogeographical evidence. Discussion led by students and faculty. *Prep. 18.131-18.136, or equivalent.*

18.880 Computers in Biology

Programming and use of computers as a tool to solve research problems. Special emphasis will be placed on problems arising in biological research and related fields. Students will solve a spectrum of problems on the University computer.

18.903 Environmental Microbiology

The microbial environment and ecology of the cell. Interactions between microbial populations, stressing soil and fresh-water associations. *Prep. 18.220 or equivalent.*

18.905 Marine Microbiology

Morphological, physiological, and ecological factors concerning marine microorganisms. Taxonomic problems, microbial association, and general methodological approaches to the study of marine microorganisms. *Prep. 18.220 or equivalent.*

18.907 Food Microbiology (2 q.h.)

Microbiology of food with emphasis on the pathogenic types and their interactions with other groups indigenous to food. *Prep. 18.220 or equivalent.*

18.908 Food Microbiology Laboratory (2 q.h.)

Detection, quantification, and isolation of microorganisms and their products in significance in food with emphasis on the pathogenic types. *Prep. 18.907 (may be taken concurrently).*

18.909 Animal Virology

Physical and chemical properties of viruses. Viruses as intracellular parasite. Viral replication and genetics, host-virus interaction, pathogenesis, disease tumor viruses, and serological reactions. Laboratory sessions will consist of demonstrations emphasizing use of animals, eggs and animal cell cultures for cultivation, isolation, and identification of viruses. *Prep. 18.220 and 18.242 their equivalent and Biochemistry.*

18.910 Microbial Genetics (3 q.h.)

Principles of bacterial and bacteriophage genetics. Nature of variation and inheritance and the mechanisms of exchange of genetic material. *Prep. 18.21 or equivalent.*

18.911 Microbial Genetics Laboratory (2 q.h.)

Origin, isolation, and characterization of mutants. Mechanisms of genetic change in bacteria and bacteriophage. *Prep. 18.910 (may be taken concurrently).*

18.914 Medical Mycology (2 q.h.)

Morphological, pathological, and epidemiological factors of pathogenic opportunistic and common fungal contaminants from human sources. *Prep. 18.220 and 18.224 or equivalents.*

8.915 Medical Mycology Laboratory (2 q.h.)

Basic methodology for demonstration and isolation of fungi in clinical specimens. Identification on morphologic and biochemical basis. *Prep. or co-requisite 8.914.*

8.920 Industrial Microbiology (3 q.h.)

Microorganisms and methods employed in production of products of economic and medical importance, decomposition of wastes, and control of desirable and unwanted processes and biodeterioration. Fermentation processes emphasized. *Prep. 18.240 or equivalent or consent of instructor.*

8.921 Industrial Microbiology Laboratory (2 q.h.)

Laboratory and discussion seminar sessions devoted to the study of selected commercial processes.

8.940 Microbial Biochemistry

Study of the enzymatic reactions, intermediate products, and metabolic pathways involved in carbohydrate, protein, and nucleic acid metabolism by microorganisms. *Prep. 18.220 and 18.240 or equivalents, and Biochemistry.*

8.980 Seminar (1 q.h.)

Various topics and newer developments in botany, microbiology, physiology, and ecology covered in depth. Student presentations are emphasized.

8.990 Special Topics in Biology (credit variable)

Special study of a selected topic under direction of a faculty member. Topic and direction of study to be arranged with the faculty member supervising the study.

8.991 M.S. Thesis

Research methods of some special field and their application to a specific problem, under direction of a faculty member.

8.992 Special Investigations in Biology (credit variable)

Laboratory studies on a topic not directly related to research being pursued for a thesis or dissertation.

8.993 Biological Electron Microscopy

Electron Microscopy as a tool in research with emphasis on specimen preparation, particularly ultra-thin sectioning. Lectures and student seminars will cover theory, laboratory procedures, and discussion of methods not used in the laboratory. Classes will meet at Henderson House, Weston, one day per week (3 hours of lecture, 4 hours of laboratory) on a day selected by mutual agreement between the class and the instructor. Given in cooperation with the Center for Continuing Education. Limited to 8 students upon certification in writing by their thesis advisers to the department chairman that the course is to be significantly applied to thesis research. Students are accepted subject to approval by the instructor.

8.995 Ph.D. Dissertation

Original research in depth, representing a significant contribution of new biological knowledge, and a written dissertation thereon, under the supervision of a faculty member.

73.814 Concepts in Pharmacology I (2 q.h.)

Selected areas of pharmacology are examined in depth with special reference to interactions of drugs and other chemical agents with biological systems. Emphasis is placed on biochemical mechanisms, experimental design, evaluation of data utilizing conventional statistical procedures, and techniques employed in pharmacological evaluations. Alternates yearly with 73.816.

73.815 Concepts in Pharmacology II (2 q.h.)

Continuation of 73.814.

73.816 Concepts in Toxicology I (2 q.h.)

Concepts of modern toxicology in which emphasis is placed on biochemical mechanisms underlying the toxicological action of drugs and other chemical substances upon biological systems. Selected topics in toxicology, including acute, subacute, and chronic effects of drugs in the experimental animal. Consideration of the predictive value of animal studies for drug effects in man. Alternates yearly with 73.814.

73.817 Concepts in Toxicology II (2 q.h.)

Continuation of 73.816.

01.952 Industrial Hygiene (2 q.h.)

Factors in the industrial environment that adversely affect the health, comfort, and efficiency of the worker. Industrial surveys, and application of engineering principles to control of dust, toxic metals, gases and vapors, organic compounds, radiation, pressure, temperature, and humidity.

01.957 Air Pollution Science (2 q.h.)

Theory and practice related to engineering management of air resources, control of gaseous emission, investigation and study of air pollution, sampling and analysis methods.

90.821 Biochemistry I (2 q.h.)

Discussion of the structures and chemistries of carbohydrates, proteins, lipids nucleic acids, and selected cofactors. *Prep. One year Organic Chemistry.*

90.822 Biochemistry II (2 q.h.)

Bioenergetics, enzymes and enzyme kinetics, intermediary metabolism, including carbohydrate catabolism, tricarboxylic acid cycle, electron transport, and oxidative phosphorylation. *Prep. Biochemistry I (90.821).*

90.823 Biochemistry III (2 q.h.)

Continuation of intermediary metabolism from Biochemistry II, or 73.842, including lipid, protein, and nucleic acid metabolism, photosynthesis, and cell regulation. *Prep. Biochemistry II (90.822).*

All undergraduate biology courses in the series designated 18.200-18.300, and selected other courses as indicated below, are available for graduate credit. Please consult the undergraduate or other appropriate bulletin for course details.

18.208 Comparative Vertebrate Anatomy	3 cl. 6 lab. 5 q.h.
18.209 Developmental Anatomy	3 cl. 6 lab. 5 q.h.
18.210 Invertebrate Zoology	3 cl. 6 lab. 5 q.h.
18.211 Parasitology	3 cl. 3 lab. 4 q.h.

B.212	Vertebrate Paleontology	3 cl. 3 lab. 4 q.h.
B.214	Current Topics in Parasitology	3 cl. 3 q.h.
B.215	Advanced Parasitology Lab	4 lab. 1 q.h.
B.220	General Microbiology	3 cl. 6 lab. 5 q.h.
B.227	Animal Histology	3 cl. 3 lab. 4 q.h.
B.228	Histological Technique	1 cl. 6 lab. 3 q.h.
B.231	Lower Plants	3 cl. 3 lab. 4 q.h.
B.232	Higher Plants	3 cl. 3 lab. 4 q.h.
B.233	Systematic Botany	2 cl. 6 lab. 4 q.h.
B.234	Plant Anatomy	2 cl. 6 lab. 4 q.h.
B.235	Economic Botany	3 cl. 3 lab. 4 q.h.
B.236	Horticulture	3 cl. 3 lab. 4 q.h.
B.237	Introduction to Plant Physiology	3 cl. 6 lab. 5 q.h.
B.238	Local Flora	3 cl. 4 lab. 4 q.h.
B.239	Terrestrial Ecosystems of North America	3 cl. 4 lab. 4 q.h.
B.240	Microbial Physiology	3 cl. 4 lab. 4 q.h.
B.242	Medical Microbiology	3 cl. 4 lab. 4 q.h.
B.245	Serology-Immunology	3 cl. 3 q.h.
B.246	Serology-Immunology Laboratory	6 lab. 2 q.h.
B.251	Comparative Animal Physiology	3 cl. 3 lab. 4 q.h.
I.252	Mammalian Physiology I	2 cl. 3 lab. 3 q.h. Structural and biochemical aspects of mammalian cells. Bioelectric phenomena; muscle and nerve function; renal physiology. Prep. Course in Vertebrate Anatomy or consent of the instructor.
I.253	Mammalian Physiology II	2 cl. 3 lab. 3 q.h. Physiology of cardiovascular, respiratory and digestive systems. Reproductive and endocrine physiology. Prep. 18.252.

chemistry

Professors

Karl Weiss, Ph.D.
Chairman
Bill C. Giessen, Dr. Sc. Nat.
Barry L. Karger, Ph.D.
Albert H. Soloway, Ph.D.
Alfred Viola, Ph.D.

Associate Professors

William E. Cass, Ph.D.
David M. Howell, Ph.D.
Conrad M. Jankowski, Ph.D.
Elmer E. Jones, Ph.D.
Philip W. LeQuesne, Ph.D.
John L. Roebber, Ph.D.
Robert N. Wiener, Ph.D.

Assistant Professors

Thomas F. Brennan, Ph.D.
Thomas R. Copeland, Ph.D.
Geoffrey Davies, Ph.D.
Arthur M. Halpern, Ph.D.
Henry E. Keller III, Ph.D.
James E. Quick, Ph.D.
William M. Reiff, Ph.D.

Admission

In addition to the admission requirements listed on page 20 an applicant must have completed not less than four full-year chemistry courses of the level required of an undergraduate major in chemistry. These must include organic, physical, and analytical chemistry. Admission policies favors those who have taken more chemistry than these minima. In addition, one year each of college physics and calculus are required and further work in these subjects is desirable.

For the full-time program, these admission requirements may be modified to accommodate applicants who have taken fewer courses than indicated above, but who have outstanding records and a strong interest in chemical or interdisciplinary research. See also the description of interdisciplinary programs.

THE MASTER'S DEGREE

Full-Time Program

The normal full-time program consists of a total of 40 quarter hours of courses, seminars, research, and a thesis based on this research. Each student is required to take at least 24 quarter hours of credit in courses. A minimum of 6 hours, but no more than 14 quarter hours of credit may be assigned to 12.991, Research and Thesis for the Master of Science degree. Each student is required to attend 12.990, Seminars in each term. One credit is assigned to a student for each term in which he conducts a seminar, up to the maximum of two credits.

Part-Time Program

The admission requirements for this program are the same as for the full-time program, but course requirements differ, and students may progress according to their abilities and the time available.

Thirty-two credits must be taken in graduate offerings of the Department of Chemistry. Eight additional credits may be taken in any graduate courses for which the student has the necessary prerequisites. The student's program shall include:

- (a) Four credits of organic chemistry. These will normally be 12.861 and 12.862.
- (b) Four credits of inorganic chemistry. These will normally be 12.841 and 12.842.
- (c) Four credits of analytical chemistry. These may be chosen from 12.821, 12.822, and 12.823.
- (d) Four credits of physical chemistry. These may be chosen from 12.881, 12.882, 12.885, 12.886, and 12.893.

In cases of unusual preparation, more advanced courses may be substituted within the given subdiscipline.

THE DOCTOR OF PHILOSOPHY DEGREE

The doctoral program in chemistry may be pursued only in residence. The additional requirements beyond those of the master's degree are designed to demonstrate superior proficiency in original research, including technical reading ability in a foreign language and familiarity with current advances in one of the main divisions of chemistry.

Residence Requirement

The residence requirement is satisfied after one year of full-time graduate work or two years of half-time work. If a student holds a teaching assistantship which occupies one half of his time, his residence requirement is being discharged at half rate. Other arrangements require faculty approval. If a candidate has a research fellowship which supports his research for the doctoral dissertation, his residence requirement is discharged at full rate. Normally, the equivalent of two years of work after establishment of doctoral candidacy is necessary to complete research.

Degree Candidacy

Degree candidacy is established in accordance with the general graduate school regulations.

Qualifying Examination

Qualifying examinations are offered in the fields of analytical, inorganic, organic, and physical chemistry. There are eight examinations offered each year in each field. A student must pass four of these.

A student is eligible to take the qualifying examination if:

- (a) he has entered with a bachelor's degree and has achieved a 3.0 average in eight courses taken in the first year of residence;
- (b) he has been admitted to the doctoral program with an awarded master's degree;
- (c) he is a part-time student who has petitioned the department after having completed at least sixteen credits of graduate courses which include fulfillment of three of the four distributional requirements listed for the part-time program. A 3.0 average is required for all courses taken.

Students in category "a" must pass the qualifying examinations by July 1 of their second year of residence. Students in category "b" must pass the qualifying examinations by July 1 of their first year of residence. Students in category "c" will have the conditions set at the time their petition is approved.

Course Requirements

A candidate is normally required by his faculty adviser to do some course work beyond the 40 quarter hour minimum. The number and nature of these courses are individually determined for each candidate.

Dissertation

In most cases, arrangements for a dissertation adviser will have been made before the completion of the qualifying examination. If not, such arrangements must be made as soon as possible after degree candidacy has been established. The dissertation adviser directs the research for the dissertation and serves as chairman of the dissertation committee which must approve the dissertation before the degree may be conferred.

Language Requirements

Proficiency must be demonstrated in a foreign language as specified by the departmental graduate committee in accordance with the general graduate school regulations. French, German, and Russian are the acceptable foreign languages. Normally, proficiency is demonstrated by taking examinations administered by the Chemistry Department.

Final Oral Examination

This examination will be held in accordance with the graduate school regulations.

DESCRIPTION OF COURSES

All courses carry two quarter hours of credit except seminar and research.

2.806 Chemical Aspects of the Environment

Consideration of problems related to air, water, food, drugs, energy, and materials. The lectures are given by experts in various fields, and are followed by discussions. *The course is open to all students with a bachelor's degree in science or engineering. It may not be used by full-time students to establish doctoral student status.*

2.821 Analytical Separations

Theory and practice of analytical separation techniques. Emphasis will be on fundamentals as they relate to practice. Topics will be based mainly on chromatographic processes including gas and high speed liquid chromatography. Other topics will include zone refining, liquid-liquid extraction, and electrophoresis.

2.822 Electroanalytical Chemistry

The principles and practice of electroanalytical chemistry will be discussed. Topics will include potentiometry and ion-selective electrodes, normal and thin-layer coulometry, polarography, and electrochemical relaxation methods. Application of these techniques to titration endpoint detection will also be discussed.

2.823 Optical Methods of Analysis

The theory and practice of absorption and emission spectroscopy. Instruments, methods, and applications will be considered.

2.824, 12.825, 12.826 Special Topics in Analytical Chemistry I, II, III

Selected topics of current importance in analytical chemistry.

2.827 Computers in Chemistry

A laboratory-lecture course illustrating the use of small digital computers for real-time control of chemical instruments. Topics will include digital logic, real-time data structures, A/D and D/A conversion, noise, and other aspects of real-time computer interfacing. Programming will be done on a PDP-11 computer in MURACL, a language designed for real-time processing. *Prep. Consent of instructor.*

2.828 Chemical Instrumentation

Principles of instrument design will be considered with emphasis on practical aspects. Instrument limitations and sources of error will be considered along with modular instruments and interfacing. *Prep. Consent of instructor.*

2.841 Advanced Inorganic Chemistry I

Application of basic quantum chemistry to inorganic systems. Russell-Saunders and j-j coupling. Stereochemistry of non-transition-metal compounds; bonding and structure of electron deficient systems.

2.842 Advanced Inorganic Chemistry II

Magnetic properties; electronic spectra and selection rules. Thermodynamic stability of coordination compounds. Experimental techniques of inorganic chemistry. *Prep. 12.841.*

12.843 Advanced Inorganic Chemistry III

Crystal symmetry. Introduction to theory of ionic; semi-conductors and metals; non-stoichiometric compounds; solid state reactions. Application of molecular orbital theory. Determination of electron distribution in transition metal compounds. Mössbauer spectroscopy and advanced magneto-chemistry. *Prep. 12.842 and 12.885.*

12.846 Coordination Chemistry

Coordination compounds: their experimental detection, calculation of stability constants, factors affecting solubility and stability constants. Ligand field theory. Acidity, color, and lability of complexes. Kinetic and stereochemical studies of inorganic reaction mechanisms. *Prep. 12.843.*

12.847, 12.848, 12.849, 12.850 Special Topics in Inorganic Chemistry I, II, III, IV

Selected topics of current importance in inorganic chemistry. *Prep. 12.842 and consent of instructor.*

12.851 Structure Determination in Solids

X-ray, electron, and neutron diffraction; elements of crystallography; computer-aided calculations. Analytical techniques; important inorganic and organic structure types. *Prep. 12.843.*

12.852 Ligand Field Theory

Crystal field theory of ions in weak and strong fields. Molecular orbital theory of transition metal complexes. Magnetic properties and electron spin resonance effects. *Prep. 12.843 and 12.886.*

12.861, 12.862 Advanced Organic Chemistry I, II

An intensive survey of organic reactions. Modern concepts of structure and mechanism are used to correlate factual material. *Prep. One year of Organic Chemistry.*

12.863 Physical Organic Chemistry

Topics in basic physical organic chemistry: molecular polarity, equilibrium and kinetics, reactivity and structure, solvent effects, acid-base catalysis, orbital symmetry, aromaticity, etc. *Prep. 12.862 or consent of instructor.*

12.864, 12.865 Stereochemistry I, II

Interrelation of steric arrangements of atoms in organic molecules with their physical and chemical properties. Conformational analysis. Spatial relationships between atoms and groups during chemical reactions and consequent effects on chemical equilibria and reaction rates as an introduction to the study of reaction mechanisms. *Prep. 12.863.*

12.866 Spectrometric Identification of Organic Compounds

Interpretation of the ultraviolet, infrared and nuclear magnetic resonance and mass spectra of organic compounds. *Prep. One year of Organic Chemistry.*

12.867, 12.868, 12.869 Natural Products I, II, III

Isolation, structure determination, synthesis, and transformations of selected classes of organic compounds of biological interest. *Prep. 12.862 (need not be taken in sequence).*

871, 12.872, 12.873 Special Topics in Organic Chemistry I, II, III
Selected topics of current importance in organic chemistry. Prep. 12.862 and consent of instructor.

876, 12.877 Mechanisms of Organic Reactions I, II

Consideration of the fundamental factors influencing the course of a chemical reaction. Utilization of these considerations in the prediction of synthetic applicability of a reaction. Prep. 12.865.

381 Thermodynamics I

First Law of Thermodynamics, Thermochemistry, Second and Third Laws, Equilibrium. Prep. Consent of instructor.

382 Thermodynamics II

Potential Molar Properties, Mixtures, E.M.F. Prep. 12.881.

385 Atomic and Molecular Structure I

Introduction to quantum mechanics. Application to simple systems, and the electronic structure of atoms and molecules. Prep. One year of Physical Chemistry.

386 Atomic and Molecular Structure II

Atomic spectroscopy. Rotational, vibrational, electronic, and magnetic spectra of all polyatomic molecules. Prep. 12.885 or consent of the instructor.

391 Special Topics in Physical Chemistry

Selected topics of current importance in physical chemistry. Prep. Consent of instructor.

392 Selected Topics in Solid State Chemistry

Solid theory. Metals, semiconductors and insulators. Thermal, magnetic, and transport properties. Alloy phases. Phase transformations and crystal defects. Surface effects. Material preparation techniques. Prep. 12.885.

393 Kinetics

Collision and transition state theories of reaction rates. Relaxation theory. Theory of unimolecular reactions. Kinetics in liquid solutions. Photochemistry. Prep. One year of physical chemistry.

394 Statistical Thermodynamics

Systems of independent particles. Distribution functions. Partition functions and thermodynamic properties. Prep. 12.881 and 12.885 or their equivalents.

395 Statistical Mechanics I

Quantum statistics; fermions and bosons. Application to electrons in metals, phonons, and photons; superfluidity and superconductivity. Prep. 12.894.

396 Statistical Mechanics II

Circumstances, noise, and irreversible thermodynamics. Boltzmann transport equations. Phase transitions of higher order; Ising model. Prep. 12.895.

397 Quantum Chemistry I

Linear algebra and the formulation of quantum theory. Angular momentum. Systems with spherically symmetric potentials and the one-electron atom. Prep. 12.886.

12.898 Quantum Chemistry II

Variational method and perturbation theory. Electron spin. SCF method and many-electron atoms. *Prep. 12.897.*

12.899 Quantum Chemistry III

Group theory. Small molecules. Time-dependent theory and selected advanced topics. *Prep. 12.898.*

12.901 Polymer Chemistry I

Introduction to polymers. Major emphasis on synthesis. Step-reaction, chain reaction, and ring-opening polymerizations. Copolymerization. Three-dimensional polymers and crosslinking. *Prep. One year of Organic Chemistry and one year of Physical Chemistry.*

12.902 Polymer Chemistry II

Physical chemistry of polymers in solution and bulk. Molecular characterization. Mechanical and physical properties in the glassy, rubbery, viscous, and semicrystalline states. *Prep. 12.901.*

12.903 Polymer Chemistry III

Industrial practice. Polymer processing. Fibers. Elastomers. Coatings. Adhesive Reinforced plastics. Relationship of polymer structure to usage. *Prep. 12.902.*

12.910 Special Projects in Chemistry

Laboratory studies on a topic not directly related to research pursued for thesis. *Prep. Permission of the departmental faculty is required.*

12.990 Seminar (1 q.h.)

Oral reports by the participants on current or recent investigations in chemistry.

12.991 Research and Thesis for M.S. (maximum: 14 q.h.)

Original research and a written thesis thereon, under supervision of a faculty member.

12.995 Research and Dissertation for Ph.D.

Original research in depth, representing a significant contribution of new chemical knowledge, and a written dissertation thereon, under the supervision of a faculty member.

90.821 Biochemistry I

Discussion of the structures and chemistries of carbohydrates, proteins, lipid nucleic acids, and selected cofactors. *Prep. One year organic chemistry.*

90.822 Biochemistry II

Bioenergetics, enzymes and enzyme kinetics, intermediary metabolism including carbohydrate catabolism, tricarboxylic acid cycle, electron transport, and oxidative phosphorylation. *Prep. Biochemistry I, 90.821.*

90.823 Biochemistry III

Continuation of intermediary metabolism from Biochemistry II, including lipid, protein, and nucleic acid metabolism, photosynthesis and cell regulation. *Prep. Biochemistry II, 90.822.*

See Biology Department offerings and College of Pharmacy offerings for other courses on chemical topics.

clinical chemistry

MASTER OF SCIENCE IN CLINICAL CHEMISTRY

Part-Time Program

Admission

In addition to the admissions requirements listed on page 20, the applicant must have completed a baccalaureate program in biology, chemistry, medical technology, or pharmacy. Undergraduate requirements in this program are a minimum of two quarters of organic chemistry, two quarters of analytical chemistry (each with a laboratory or its equivalent), two quarters of human physiology, and two quarters of physical chemistry. An individual who has deficiencies in any of these areas may take appropriate evening courses at Northeastern University concurrently with those graduate courses which do not require the deficient prerequisites. The appropriate evening courses offered at University College of Northeastern University are: Analytical Chemistry 2.521-6, Organic Chemistry 12.531-3, Physical Chemistry 12.541-3, Human Anatomy and Physiology 18.524-6. Equivalent courses from this university or other universities will be accepted.

Program

The Master of Science in Clinical Chemistry is an interdisciplinary program with the College of Pharmacy and Allied Health Professions. Forty quarter hours of academic coursework are required. In addition, student must have at least one year of acceptable clinical laboratory experience prior to completion of academic degree requirements. The program is available on a part-time basis with courses offered primarily during the evening hours. Courses are scheduled in the Fall, Winter, Spring, and Summer Quarters. The following are core courses required in the program:

	Total Credits
12.821 Analytical Separations	2
12.823 Optical Methods of Analysis	2
72.834 Clinical Chemistry I	2
72.835 Clinical Chemistry II	2
72.837 Seminar and Report in Clinical Chemistry*	2
73.845 Radioisotopes in Biological Systems	2
87.807 Biometrics	2
87.810 Functions of Human Systems	2
90.821 Biochemistry I	2
90.822 Biochemistry II	2
90.823 Biochemistry III	2
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*The first quarter of 72.837 is a required course. However, the course may be repeated twice as an elective.

Twelve additional credits must be taken from the following elective core courses:

	Credits
12.822 Electroanalytical Chemistry	2
12.824 Special Topics in Analytical Chemistry I	2
12.825 Special Topics in Analytical Chemistry II	2
12.827 Computers in Chemistry	2
12.828 Chemical Instrumentation	2
72.836 Special Topics in Clinical Chemistry	2
72.837 Seminar and Report in Clinical Chemistry	2
72.861 Central Nervous System Depressants	2
72.862 Autonomic Drugs	2
72.863 Anti-infectives	2
72.864 Cancer Therapy	2
72.865 Special Topics in Medicinal Chemistry	2
73.816 Concepts in Toxicology I	2
73.817 Concepts in Toxicology II	2
73.844 Drug Metabolism	2
87.811 Pathophysiology I	2
87.812 Pathophysiology II	2

Taken with the approval of the Admissions Committee and the course instructor, selection may be made from the above courses as well as the following and other appropriate graduate courses in the University

	Credits
12.841 Inorganic Chemistry I	2
12.842 Inorganic Chemistry II	2
12.846 Coordination Chemistry	2
12.855 Atomic and Molecular Structure I	2
12.861 Advanced Organic Chemistry I	2
12.862 Advanced Organic Chemistry II	2
12.863 Physical Organic Chemistry	2
12.866 Spectrometric Identification of Compounds	2
12.881 Thermodynamics I	2
12.893 Kinetics	2
18.245 Immunology	3
18.840 Comparative Physiology of Regulatory Mechanisms	2
18.842 Vertebrate Endocrinology	2
18.843 Procedures in Endocrinology	3
18.860 Cell Biophysics and Biochemistry	5
18.909 Animal Virology	4
18.940 Microbial Biochemistry	4
72.837 Seminar and Report in Clinical Chemistry	2
73.814 Concepts in Pharmacology I	2
73.815 Concepts in Pharmacology II	2
73.818 Special Topics in Pharmacology	2
73.819 Pharmacological Instrumentation	2
72.866 Phytochemistry	2
87.802 Advanced MLS Hematology and Immunology	2

DESCRIPTION OF COURSES

All courses carry two quarter hours of credit unless otherwise indicated.

Courses with the prefix number 12 are chemistry offerings. Their descriptions may be found in the preceding section of this bulletin along with interdisciplinary biochemistry courses (prefix number 90).

.834 Clinical Chemistry I

Principles, instrumentation, methodology, and interpretations in clinical chemistry. *Prep. 90.823.*

.835 Clinical Chemistry II

Continuation of Clinical Chemistry I. *Prep. 72.834.*

.836 Special Topics in Clinical Chemistry

Recent advances and techniques in clinical chemistry. *Prep. 72.835.*

.837 Seminar and Report in Clinical Chemistry

Reports and discussions of current journal articles in clinical chemistry. *Prep. 72.835.*

.861 Central Nervous System Depressants*

Presentation and discussion of the chemistry, structure-activity relationships, and mechanism of action of general anesthetics, hypnotics and sedatives, anti-seizure drugs, analgesics, tranquilizers, and muscle relaxants. A consideration of the mechanics of drug design and methods of modification will be undertaken. *Prep. Two quarters of Organic Chemistry, offered alternate years.*

.862 Autonomic Drugs*

Discussion of drugs acting on the central nervous system with a special emphasis on the mechanism of action of the chemical mediators of the peripheral nervous system. The role of agents affecting this system—adrenergic and cholinergic and reversible and irreversible inhibitors of these systems will be discussed in relation to their chemical structure and biological activity. *Prep. Two semesters of Organic Chemistry. Offered alternate years.*

.863 Anti-infectives*

Study of the various chemotherapeutic agents employed in the treatment of infectious diseases. Included will be the sulfonamides, antibiotics, antivirals, tubercular, antifungal, and antimalarial agents. Special emphasis will be on structure-activity relationships, mechanisms of action, and modern research in this area. *Prep. Two quarters of Organic Chemistry. Offered alternate years.*

.864 Cancer Therapy*

Recent developments in new approaches to the treatment of cancer from a chemotherapeutic standpoint will be considered: including alkylating agents, antimetabolites, hormones, and miscellaneous compounds, and combinations of the above with radiation and immunology. Possible mechanisms of action will be explored. *Prep. Two quarters of Organic Chemistry. Offered alternate years.*

72.865 Special Topics in Medicinal Chemistry*

A consideration of a special area of medicinal chemistry including either CN compounds, pharmacodynamic agents or chemotherapeutics; their chemist and structure-activity relationships will be presented. *Prep. Two quarters of Organic Chemistry. Offered alternate years.*

72.866 Phytochemistry*

The important classes of chemical compounds produced by plants considered from the standpoint of their biogenetic origin, methods for their detection, isolation and characterization; application of these techniques to research in pharmacy, medicine, economic botany, taxonomy; and introduction to the literature of plant chemistry. *Prep. Two quarters of Organic Chemistry, two quarters of Biology. Offered alternate years.*

73.816 Concepts in Toxicology I*

Concepts of modern toxicology in which emphasis is placed on biochemical mechanisms underlying the toxicological action of drugs and other chemical substances upon biological systems. Selected topics in toxicology including acute, subacute, and chronic effects of drugs in the experimental animal and man. Consideration of the predictive value of animal studies for drug effect in man. *Prep. Permission of Instructor. Offered alternate years.*

73.817 Concepts in Toxicology II*

Continuation of Concepts in Toxicology I. *Prep. 73.816. Offered alternate years.*

73.844 Drug Metabolism

Presentation of detoxication mechanisms relating to drug metabolism and excretion patterns: adaptive factors influencing metabolism will be discussed. *Prep. Biochemistry I, 90.821.*

73.845 Radioisotopes in Biological Systems

Methodology of radioactive nuclides and application of these isotopes to biology and medicine with special emphasis on their use in clinical analysis.

Other biology, chemistry, and pharmacy courses may be taken with the approval of the admissions committee and the course instructor.

economics

Professors

Morris A. Horowitz, Ph.D.,

Chairman

Harold M. Goldstein, Ph.D.

Irwin L. Herrnstadt, Ph.D.

Gustav Schachter, Ph.D.

Donald Shelby, Ph.D.

Assistant Professors

Hyun Sik Chung, Ph.D.

Craig Coelen, Ph.D.

Pawan K. Sawhney, Ph.D.

Andrew Sum, M.A.

Steven Swanson, Ph.D.

Associate Professors

Conrad P. Caligaris, Ph.D.

Ernest M. DeCicco, Ph.D.

Daryl A. Hellman, Ph.D.

Sungwoo Kim, Ph.D.

Peggy Musgrave, Ph.D.

The Economics Department offers three terminal programs with different admission requirements and program form and content in an effort to serve students with varying backgrounds, interests, and goals. These programs are: a non-degree certificate program, a master's degree program with specialization in one of four available fields and a doctoral degree program with specialization in the fields of manpower and urban/regional economics.

CERTIFICATE PROGRAM

The Economics Department offers a non-degree program in the Economics of Manpower and Development Planning. Upon completion of the prescribed program, students will receive a certificate issued by the Graduate School of Arts and Sciences, Northeastern University. The program is designed for students interested in a specialized program courses in manpower and development planning but who do not wish meet the requirements of a degree program.

Admission

Admission to the program will be considered for graduates of recognized universities or institutes of technology, although practical experience in manpower planning or development planning may be substituted for the admission requirements at the discretion of the faculty. All foreign students must submit a TOEFL test score or an equivalent certification of the applicant's proficiency in English along with the application and academic transcripts.

Program

This certificate program is designed to be completed in one year. Students admitted to the program may not transfer into the regular degree programs. Evidence of completion of a course and of the program shall be attendance, all required reading, and all written work. Successful completion of a course shall be noted by a pass designation.

Fall Quarter (All four courses required)

- 39.9B0 Introductory Macroeconomics
- 39.9A0 Introductory Microeconomics
- 39.9G1 Economics of the Labor Market
- 39.9P1 Economic Development

Winter Quarter (Select any two of three electives listed)

- 39.250 Statistics (Required)
- 39.9G4 Manpower Planning I (Elective)
- 39.9P4 Regional Development (Elective)
- 39.9Q1 Development Finance (Elective)

Spring Quarter (Select any three of four courses listed)

- 39.9J1 Seminar in Human Resource Development
- 39.9R1 Seminar in Development Planning
- 39.9G5 Manpower Planning II
- 39.9P6 Comparative Economic Development

Variations in this basic program are possible only with prior approval of the Graduate Director.

THE MASTER'S DEGREE

Forty quarter hours of academic work are required. This program comprises 16 quarter hours of required core course work and 24 quarter hours of electives of which a minimum of twelve quarter hours must be selected from one of the economic fields listed below. The required core courses must be completed as soon as possible. With the approval of the graduate adviser, a student may select a maximum of six quarter hours from graduate courses offered by other departments, or two advanced undergraduate courses in economics carrying three quarter hours of graduate credit.

Admission

In addition to the requirements listed on page 20, applicants should have had a minimum of 12 semester hours of economics, or the equivalent, of which three semester hours, or the equivalent, should be statistics. Admission is only possible in the Fall and Winter Quarters. Application for admission to the Fall Quarter will be given consideration if received by August 31. Applications for admission to the Winter Quarter will be given consideration if received by November 30.

Applications for financial aid should be submitted no later than March 15. See page 33 for information on financial aid available.

comprehensive Examination

A comprehensive examination, which will be held in accordance with general graduate school regulations, must be taken by all students during the quarter in which the student completes the 40 quarter hours academic work. The examination may be repeated only once.

Master's Thesis

A master's thesis for six quarter hours of credit is optional with the approval of the graduate adviser. Approval will be granted only in those instances in which previous graduate work of the student indicates capacity for independent study.

Required Core Courses

The required core courses are:

	Credits
39.9A1 Microeconomic Theory*	4
39.9B1 Macroeconomic Theory*	4
39.9D1 Mathematics for Economists**	4
39.9E1 Statistical Inference	4

Economic Fields

Available economic fields are listed below. Under each field are stated the required field courses and the elective field courses. Students must take at least twelve quarter hours in one field of concentration. In all fields the first listed required course in the field ordinarily should be taken first by the student majoring in the field. For students not majoring in the field, courses in the field may be taken in any sequence.

Manpower Economics

Required field courses:

- 39.9G1 Economics of the Labor Market and Labor Force
- 39.9G4 Economics of Manpower Planning I
- 39.9J1 Seminar in Human Resource Development

Elective field courses:

- 39.9G5 Economics of Manpower Planning II
- 39.9G7 Public Policy in Manpower
- 39.9H1 Economics of Medical Care and Health Manpower
- 39.9H3 Economics of Education

Urban/Regional Economics

Required field courses:

- 39.9K1 Regional Economics
- 39.9L1 Urban Economics I
- 39.9N1 Seminar in Urban/Regional Economics

* Candidates deficient in intermediate theory may not be admitted into these core courses until they have completed 39.9A0 and/or 39.9B0.

** New candidates must take a mathematics examination given by the department during registration period. Those who fail may not enroll in 39.9D1 until they have completed 39.9D0.

Elective field courses:

- 39.9K5 Economics of Crime
- 39.9L2 Urban Economics II
- 39.9L5 Economics of Urban Transportation
- 39.9L7 Economics of Inter-City Transportation
- 39.9M1 Intergovernmental Fiscal Relations

Development Economics

Required field courses:

- 39.9P1 Economic Development
- 39.9P3 Regional Development
- 39.9R1 Seminar in Development Planning

Elective field courses:

- 39.9P6 Comparative Economic Development
- 39.9Q1 Development Finance
- 39.9G4 Economics of Manpower Planning I
- 39.9K1 Regional Economics

Economics of Money and Finance

Required field courses:

- 39.9S1 Monetary Theory
- 39.9S3 Monetary Policy
- 39.9V1 Seminar in Money and Finance

Elective field courses:

- 39.9T1 Public Policy and Finance
- 39.9T5 Capital Markets
- 39.9Q1 Development Finance
- 39.9M1 Intergovernmental Fiscal Relations

THE DOCTOR OF PHILOSOPHY DEGREE

The doctoral degree program in economics is offered in the fields of manpower economics and urban/regional economics.

Admission

Applicants who will have a master's degree in economics or its equivalent at entry may be considered for direct admission to the doctoral program. Applicants who will not have a master's degree in economics or its equivalent at entry may apply for admission to the doctoral program after the satisfactory completion of 40 quarter hours of graduate work.

Admission to the doctoral program is possible only in the fall term. Applications for the doctoral program must be submitted no later than March 15.

Residence Requirement

After acceptance to the doctoral program, the student may satisfy the residence requirement by one year of full-time graduate work.

aching assistants may satisfy the residence requirement by two consecutive years of half-time graduate course work. A student should expect to spend at least two academic years in full-time study, or its equivalent, completing the requirements for the doctoral degree.

Degree Candidacy

Degree candidacy is established in accordance with the general graduate school regulations.

Course Requirements

A. At least 32 quarter hours of graduate work beyond the master's degree will be required. These include:

Required Core Courses:

- 39.9A2 Microeconomics II
- 39.9B2 Macroeconomics II
- 39.9E7 Econometrics I
- 39.9E8 Econometrics II

B. Concentration in the two academic fields of manpower economics and urban/regional economics. Course work in each field must include doctoral seminars 39.9J3 and 39.9N3. Each of these seminars has a prerequisite of 12 quarter hours of graduate work in the field.

Qualifying Exam

Each student must pass a comprehensive qualifying examination after the completion of the required core and field courses. This comprehensive will be given in parts: (1) A two-hour written exam in each of the general areas of microeconomic theory, macroeconomic theory and quantitative methodology; (2) a three-hour written exam covering the two doctoral fields; (3) A two-hour oral exam covering the two doctoral fields. Passing the qualifying exams signifies that the student has completed all course requirements and can now devote all his time to dissertation. The examination may be repeated only once.

Doctoral Dissertation

An original doctoral dissertation is required of all students in accordance with the general graduate school regulations and the regulations established by the department. After the successful completion of his qualifying examination, each student shall work with a dissertation adviser under whose guidance he will write his doctoral dissertation. The dissertation adviser serves as chairman of the dissertation committee which must approve the dissertation before the degree may be conferred.

Final Oral Examination

The final oral examination will be established in accordance with the general graduate school regulations.

DESCRIPTION OF COURSES

All courses carry three quarter hours of credit unless otherwise specified.

39.9A0 Introduction to Intermediate Microeconomic Theory

Intensive coverage of microeconomic theory. This course offers no credit toward a degree in economics.

39.9A1 Microeconomic Theory I (4 q.h.)

A non-math treatment of microeconomic theory at the beginning graduate level. An investigation of the conditions underlying consumer and producer equilibrium under different objective functions and various market structures. Derivation of product demand curves, supply curves, and factor demand curves for alternative market structures in product and factor markets are surveyed.

39.9A2 Microeconomic Theory II (4 q.h.)

An examination of contemporary microeconomic problems and theory with specific emphasis on welfare economics, general equilibrium, distribution, the theory of the firm, and the ability of modern value theory to reach meaningful and feasible policy conclusions. *Prep. 39.9A1 and consent of instructor.*

39.9B0 Introduction to Intermediate Macroeconomic Theory

Intensive coverage of macroeconomic theory. *This course offers no credit toward a degree in economics.*

39.9B1 Macroeconomic Theory I (4 q.h.)

Income and employment theory; classical, Keynesian, and post-Keynesian aggregate demand and supply systems.

39.9B2 Macroeconomic Theory II (4 q.h.)

Theory and problems of macro-dynamics, growth, inflation, cycles, and stabilization policy. *Prep. 39.9B1 and consent of instructor.*

39.9D0 Introduction to Mathematics for Economists (4 q.h.)

This course acquaints the student with the algebra and elementary calculus necessary for quantitative economics: simultaneous linear systems; polynomial, logarithmic, and exponential functions; and elementary differential and integral calculus (meets four hours a week). *This course offers no credit toward a degree in economics.*

39.9D1 Mathematics for Economics (4 q.h.)

Application of matrix algebra and simple multivariate calculus to economic analysis. Static organization and dynamic analysis, difference and differential equations. Examples from economic theory. *Prep. 39.9D0 or mathematics examination.*

39.9E1 Statistical Inference (4 q.h.)

Estimation of population values and testing hypotheses. Classical estimation and testing compared to Bayesian Probability. Topics covered include the normal, binomial, Poisson, hypergeometric, exponential, X^2 , F, and other probability distributions and the design of sample surveys.

E5 Economic Programming

nomic programming with emphasis on linear programming, including the transportation and simple problems, and simulation and queuing theory with applications to the computer. *Prep. 39.9D1.*

E7 Econometrics I

Review of matrix algebra; single equation least squares estimates and their theoretical properties; hypothesis testing and measures of goodness of fit; definitions of and tests for autocorrelation, heteroskedasticity, and multicollinearity; simultaneous equations estimation: identification, bias, and alternative estimation techniques. *Prep. 39.9D1, 39.9E1.*

E8 Econometrics II

ymptotic and small sample properties of various estimators; rank-order conditions for identification; specification error and error in variables; remedies for autocorrelation and multicollinearity; dummy variables; distributed lags; forecasting and simulation; non-linear estimation; alternative estimation techniques (two-stage least squares, three-stage least squares, maximum likelihood estimators, etc.). *Prep. 39.9E7.*

3 Data Processing

Study of digital computers and computer programming techniques. The FORTRAN language is utilized for programming and running several projects.

G1 Economics of the Labor Market and Labor Force

Macro- and micro-analysis of labor supply and demand. Labor force measurement and change. Functioning of labor markets. Labor allocation. Wage and employment determination. Changes in the composition of labor demand. Impact of technological change. Unemployment. Income distribution and poverty. *Prep. 39.9A1 co-requisite.*

G4 Economics of Manpower Planning I

The role of manpower planning and its integration with general development planning. Analysis and evaluation of different techniques of manpower planning. Technological versus economic methods. Practice of manpower forecasting and its problems. Skill training versus educational strategies. Models of educational planning and their applications to different countries. *Prep. 39.9A1 co-requisite.*

G5 Economics of Manpower Planning II

Applications of manpower planning methods and techniques to problems of national economic development. Cost-benefit and cost-effectiveness of educational and manpower programs. Special problems of health manpower, scientists, engineers, and technicians. Evaluation of methods and prediction used in national manpower plans. *Prep. 39.9G4.*

G7 Public Policy in Manpower

Analysis and evaluation of national manpower programs and their implementation on the local level. Relationships between public policy and policies of employers and unions; relationships between programs at different levels of government.

39.9H1 Economics of Medical Care and Health Manpower

The organization of medical care, the problems associated with various alternative delivery systems, the utilization and availability of physicians and other categories of paramedical personnel, the growth and pressures exerted by third party payers; and consideration of federal, state, and municipal participation in the delivery of quality medical care under various alternatives for national health insurance.

39.9H3 Economics of Education

An examination of the contribution of education to the process of economic growth and the way education is produced and distributed. Special topics include: inequalities in returns to education; the role of intelligence and class background in educational success; and socializing role of education in production.

39.9J1 Seminar in Human Resource Development

Selected topics on the development and use of human resources. *Prep. Consent of instructor.*

39.9J3 Manpower Economics Research Seminar (4 q.h.)

Prep. 12 q.h. of Manpower Economics, and consent of instructor.

39.9K1 Regional Economics

Delineating regions. Theories of location for firms, industries, and people. Regional income accounting systems, and models of intra- and inter-regional income determinants and impact analysis. *Prep. 39.9A1 co-requisite.*

39.9K4 Externalities

Theoretical foundations for urban and regional economics. Survey of economic theory related to externalities and welfare economics. *Prep. 39.9A1 and consent of instructor.*

39.9K5 Economics of Crime

A discussion of the resource allocation problem as it relates to criminal behavior and effective law enforcement. Evaluation of costs and benefits of alternative law enforcement policies. Criminal activity, including organized crime, will be analyzed in an economic context.

39.9L1 Urban Economics I

The economy of cities. Analysis of intra-metropolitan spatial relationships including residential location, land, and housing markets. *Prep 39.9A1 co-requisite.*

39.9L2 Urban Economics II

Continuation of Urban Economics I. Problems in urban economics including segregation, housing, transportation, urban renewal, and related policy issues. *Prep. 39.9L1.*

39.9L5 Economics of Urban Transportation

Urban agglomeration, economic activities, residential concentration and transportation network; urban and suburban densities in relation to the central place; capital budgeting; pricing; costs incidence and externalities of various modes; cost-benefit analysis; effects of transportation patterns on urban socio-economic life; modal split and forecasting economic requirements for integrated urban transport needs.

9L7 Economics of Inter-City Transportation

Investigates the rationale for intercity freight and passenger movements within framework of interregional commodity flows. The choice of mode once traffic volume has been determined. The economic and environmental impacts of the choice of mode is studied.

9M1 Intergovernmental Fiscal Relations

Study of the development of the federal system, interstate and interarea fiscal comparisons, grants-in-aid, tax credits, revenue sharing, state and local taxes, intergovernmental tax revenues, borrowing and budgeting at the state and local level, and a discussion of the process and prospects of state and municipal equalization of burden and effort. *Prep. 39.9A1.*

9N1 Seminar in Urban/Regional Economics

Selected topics in urban/regional economics. *Prep. Consent of instructor.*

9N3 Urban/Regional Research Seminar (4 q.h.)

Pr. 12 q.h. of Urban/Regional Economics.

9P1 Economic Development

Study of the prospects of economic growth in less developed areas. Measurement and theories of economic development. Role of human and natural resources, education, technology, and capital formation in national, regional, and total development. Changes in institutions.

9P3 Regional Development.

Inter-regional dynamics, dualism, and spontaneous polarization. Growth poles, convergence, and spread effect; inter-regional factor migration and social cost; regional structural change and dynamic analysis; public policies and planning; socio-economic variables and measurements; feasibility and simulation in short-run analysis. Examples of regions at county, province, state and "area" level; differentiation between political and economic boundaries; bootstrapping vs. outside source approach. Application of the FS and UN multiregional models.

9P6 Comparative Economic Development

Comparison of economic systems in differing stages of economic development exemplified by Yugoslavia, Southern Italy, Turkey, the Middle East, and China.

9Q1 Development Finance

Sources of investment finance in developing countries; role of taxation and tax structure reform; development of financial institutions and capital markets; private and official finance from abroad and debt-service problems; problems of monetary management and export instability.

9R1 Seminar in Development Planning

Planning techniques at the national, regional project and plan level. Planning system of regions; interindustry economic programming; interdependence, resource use, and structural change. Application of input-output and linear and non-linear optimal decision techniques to short-run planning and long-run projection. Evaluation of discontinuities, linkages, and "openness." Planning in closed and open economy. The role of the private sector and the governments, its sequence, and optimality in planning. Application of techniques to empirical examples. *Prep. Consent of instructor.*

39.9S1 Monetary Theory

A study of the relationships between money and economic activity with emphasis upon various quantity theory models and theories of the demand for money and velocity. *Prep. 39.9B1 co-requisite.*

39.9S3 Monetary Policy

A study of the interrelationships between aggregate economic activity, financial markets and central banking instruments, objectives and policy.

39.9T1 Public Policy and Finance

Techniques of fiscal policy, fiscal policy norms, public sector debt; tax policy, federal tax reform; the conflict between social implications of price stabilization and full employment; public expenditure policy and the interrelationship between monetary and fiscal controls. *Prep. 39.9B1 co-requisite.*

39.9T5 Capital Markets

Primary sources of savings and demand for financial assets; role of financial intermediaries; banking system and government lending agencies. Demand for funds and real investment—mortgage, corporate and government securities markets; interdependence of rate structures. Flow of funds data in relation to national income accounts.

39.9V1 Seminar in money, credit, and banking.

Selected topics in the economics of money, credit and banking. *Prep. Consent of instructor.*

39.9Z1 Master's Thesis Seminar (maximum 6 q.h.)

Thesis supervision by members of the department; approval of graduate adviser required.

39.9Z2 Readings in Economics (up to 3 q.h.)

Supervised reading in selected topics in economics. *Prep. Consent of instructor and approval of graduate adviser.*

39.9Z5 Doctoral Dissertation Seminar (no credit)

Prep. Approval of graduate adviser required.

English

Professors

Paul C. Wermuth, Ph.D.,
Chairman
Arthur J. Weitzman, Ph.D.,
Director of Graduate Studies
James T. Barrs, Ph.D. (Emeritus)
Raymond E. Blois, Ph.D.
Victor E. Howes, Ph.D.
Samuel French Morse, Ph.D.
Stanley J. Trachtenberg, Ph.D.

Associate Professors

Robert J. Blanch, Ph.D.
I. X. Lesser, Ph.D.
Jane A. Nelson, Ph.D.
Robert B. Parker, Ph.D.
Winley E. Roby, Ph.D.
Herbert L. Sussman, Ph.D.

Assistant Professors

Samuel J. Bernstein, Ph.D.
Irene R. Fairley, Ph.D.
Gerald Griffin, Ph.D.
Norma Kroll, Ph.D.
James Nagel, Ph.D.
Donald Roemer, Ph.D.
Joseph E. Westlund, Ph.D.

THE MASTER'S DEGREE

The Department of English offers a program leading to the M.A. degree. The courses emphasize training in research and criticism in fields of English and American literature, and they provide the student the comprehensive background necessary for a career as a scholar, teacher, and writer.

Amission

Applicants are judged favorably if they do superior work in their undergraduate preparation and do significantly better than average in verbal and advanced sections of the Graduate Record Examination, scores of which are required before an application will be considered. An applicant is expected to have had at least 24 semester credits in English beyond the freshman level and have achieved a 3.0 average in English courses on a 4 point scale. Recommendations should be submitted by former English professors. An applicant who is deficient in any one of these areas may be admitted as a provisional student.

The category of special student is provided for those nondegree students who wish to take a summer course or those already enrolled

in a graduate program in another institution who wish to transfer credit. A holder of a graduate degree in English may also enroll as a special student.

Program

Forty-two quarter hours of academic work are required. The course work must include 30.8A1, Bibliography and Literary Historiography, which should be taken as soon as the student enters the program. Required also are three hours from courses in Group II; three hours from courses in Group III; and three hours from courses in Group IV; three hours from courses in Group V (or their equivalents among the seminars); and fifteen hours in designated seminars, which are limited enrollment to twelve students. The remaining twelve hours may be elected from any courses in the program.

Transfer Credit

A student may transfer from another institution no more than 12 quarter hours (9 semester hours) of graduate credit in English. Within this limit, graduate courses in other fields may also be transferred if their relevance to the student's specialized interest can be demonstrated. In every case, a petition for graduate credit must be sent to the Director of the Graduate School of Arts and Sciences with a copy of an official transcript.

Thesis

A thesis is optional. A student wishing to write a master's paper must secure the approval of a graduate faculty member and write the thesis under the supervision of his adviser. Six credits in lieu of course work are allowed. The student must enroll in 30.9Z1, Thesis, to obtain credit. Papers must conform to the guidelines laid down in the *MLA Style Sheet*.

Comprehensive Examination

A three-hour comprehensive examination is required. It will be given during the Fall and Spring Quarters. Copies of previous examinations are available in the graduate director's office. A student must accrue 30 quarter hours of credit before he is eligible to take the examination. The examination may be taken only twice. As an option, students may choose an oral examination in lieu of the written comprehensive.

Language Requirement

Normally a degree candidate must pass a reading examination in French or German or Latin. Substitutions must have the approval of the graduate director. Exemption from the examination may be obtained by submitting evidence of having passed with at least a grade of C an advanced undergraduate language course carrying six credits.

DESCRIPTION OF COURSES

All courses carry three quarter hours of credit unless otherwise specified.

GROUP I

(three quarter hours required)

0.8A1 Bibliography and Literary Historiography

aterials and techniques of research in English and American literature; bibliography, form, and content of papers and theses; problems of literary story.

GROUP II

(three quarter hours required)

0.8B1 Theories of Criticism

modern critical theories including New Critical, psychoanalytic, and Marxist. *Course may not be used to satisfy group requirement.*

0.8C1 Historical Linguistics I

ritten records; the classification of language; phonetics and phonetic change; e comparative method; dialect geography.

0.8C2 Historical Linguistics II

continuation of 30.8C1. Fluctuation; analogic and semantic change; cultural, timate, and dialect borrowing. *Prep. 30.8C1.*

0.8C4 Semantics

he relation between language and behavior; the concept of change, variety, d uniqueness; symbols; levels of abstraction; habits of evaluation of linguistic enomena; and modification of such habits in the direction of human adjust- ent, understanding, and survival.

0.8C5 History of the English Language I

he nature and origin of language; ancestry and early growth of English; phonetics, sound-change, and history of English sounds; history of English flections; sources of the vocabulary; the making of words.

0.8C6 History of the English Language II

semantic change; syntax and usage; dictionaries, spelling, pronunciation, varia- ons, and usage. *Prep. 30.8C5.*

0.8C7 Language and Its Structure

introduction to the study of language, the principles and methods of linguistic escription; the development of the science of language, of descriptive and generative linguistics. Emphasis on goals of modern linguistic theory.

0.8D1 Introduction to Old English

0.8D6 Chaucer's Troilus and Criseyde and Other Poems

he *Book of the Duchess*, *The House of Fame*, and *Troilus and Criseyde*, with look at *The Romaunt of the Rose*.

0.8D7 Chaucer's Canterbury Tales

GROUP III
(three quarter hours required)

30.8E1 Tudor Literature

Wyatt and Surrey, Sidney, Raleigh and the beginnings of prose fiction.

30.8E4 Renaissance Drama

Twelve representative Elizabethan and Jacobean comedies and tragedies.

30.8F1 Seventeenth-Century Literature

Major prose and poetry of the seventeenth century, excluding drama: Bacon, Hobbes, Browne, Bunyan, Donne, Herbert, Jonson, Marvell, and others.

GROUP IV
(three quarter hours required)

30.8G1 Restoration and Early Eighteenth Century

A critical study of neoclassical drama, poetry, and criticism: Restoration drama, Dryden, and Pope.

30.8G6 Age of Johnson

Johnson, Boswell, and the Club: Burke, Goldsmith, and Gibbon; poetry of Cowper, Gray, and Burns.

30.8H1 Romanticism

General introduction to English Romanticism as an intellectual and artistic movement.

30.8J1 Victorian Literature

General survey touching upon major genres of Victorian literature with emphasis on the transition from the Victorian to the "modern." Such writers as Carlyle, Ruskin, Brontes, Swinburne, Pater, Wilde.

30.8K1 Twentieth-Century British Literature

Theme and structure in the work of several dramatists from Shaw to Osborne and of several novelists from Conrad to Anthony Powell with an emphasis on major trends in the novel and in drama during the present century. Course may not be used to satisfy group requirement.

GROUP V
(three quarter hours required)

30.8L1 American Literature to 1830

A survey of American literature during its first two centuries, from the Puritans to the Knickerbockers, from William Bradford to James Fenimore Cooper.

30.8M1 Nineteenth-Century American Literature

A critical examination of the major works of the period including Cooper's *The Pioneers*, Emerson's *Nature*, Thoreau's *Walden*, Hawthorne's *Marble Faun*, Melville's *Moby Dick*, Whitman's *Leaves of Grass*, Twain's *Huckleberry Finn*, Adams' *Education*, and James's *What Maisie Knew*.

30.8N1 Twentieth-Century American Literature

Chance collisions: Adams, Dreiser, Crane, Dos Passos, Fitzgerald, Cozzens, Faulkner. The beginnings and development of Naturalistic fiction.

SEMINARS

(Fifteen quarter hours of seminar courses are required, of which three credits must be in a pre-nineteenth-century period.)

9B1 Critical Schools

The subject of this year's seminar will be structuralism and formalism.

9B3 English Prose

9B4 Short Fiction

The short stories of Sherwood Anderson and Ernest Hemingway and their contribution to American literature.

9B5 Comic Drama

Comic Spirit and its manifestations in dramatic literature and performance; nature and forms of comic playwriting from Aristophanes to the present; examination of the theater's comic forms: farce, comedy, satire, parody.

9B6 Tragic Drama

This course will consider important theories of tragedy and certain plays in an effort to consider the relation, if any, which exists between theory and practice in the tragic genre.

9B7 Theatrical Styles

examination of modern dramatic expression and theory. The course will give particular attention to absurdist drama, existentialist drama, and Brecht's theatre of alienation.

9C1 Phonetics and Dialectology

Studying of the International Phonetic Alphabet (IPA) and of a standard phonetic alphabet; their application to practical work in recording and studying standard speech and dialects.

9C2 Descriptive Linguistics

Formation (stress, pitch, juncture); phonemics; morphemes and morphology; syntactic devices; the process of communication; variation in speech; etc. p. 30.9C1.

9C5 Transformational and Generative Grammar of English

Deep and surface structures and transformations necessary to generate the latter; graphic representations of structure; deep-structure nature of adjectives, nouns, prepositions, auxiliaries, possessives, etc.; comparison with traditional grammar.

9C7 Linguistics and Literary Study

Formal properties of poetry and prose. Linguistic approaches to problems of style, metaphor, form, and meaning. Contribution of linguistic analysis to literary criticism, and to a theory of literature.

9D1 Beowulf

p. 30.8D1

30.9D2 Old English Poetry

Prep. 30.8D1

30.9D5 Middle English Lyrics and Drama

A study of the epic and romance, concentrating on the transformation of the epic to the courtly hero: works to include in translation *Beowulf*, *Chretien de Troye* the *Nibelungenlied*, and *Le Morte D'Arthur*.

30.9D8 Studies in Fourteenth-Century Literature

Major works in Middle English including *Sir Gawaine and The Green Knight*, *The Pearl*, and *Piers Plowman*.

30.9E1 Studies in Renaissance Poetry

Shakespeare, Marlowe, Jonson et al.

30.9E4 Jacobean Drama

About ten plays, mostly tragedies (except for Jonson); the course presumes knowledge of Shakespeare's late tragedies and romances.

30.9E5 Shakespeare's Histories

The English history plays from *Richard III* to *Henry V*, plus *Titus Andronicus*, *Julius Caesar*, and *Troilus and Cressida*.

30.9E6 Shakespeare's Tragedies

Eight Plays from *Richard II* to *Antony and Cleopatra*.

30.9E7 Shakespeare's Comedies

Eight plays from *Comedy of Errors* to *The Temepest*.

30.9E8 Problems of Shakespearean Interpretation

Present and historical approaches will be considered for the light they shed on several Shakespearean works; a general knowledge of Shakespearean drama and poetry is presumed.

30.9F1 Metaphysical Poetry

Analysis of the structure and texture of poems by Donne, Herbert, and Marvell to determine the distinguishing characteristics of the metaphysical approach to poetry.

30.9F4 Seventeenth-Century Thought

Discussion of seventeenth century theories on science, religion, politics, and art as expressed in Bacon, Burton, Browne, Locke, and Hobbes.

30.9F6 Milton's Major Poetry

Milton's poetic and intellectual achievement will be studied by analyzing his major works. Particular emphasis will be given to *Paradise Lost* as an expression of Renaissance humanism and the culmination of the epic tradition.

30.9G2 Restoration and Eighteenth-Century Drama

Plays of Etherege, Wycherley, Dryden, Vanburgh, Congreve, Gay, Lillo, Goldsmith, and Sheridan.

30.9G5 Intellectual Prose of the Eighteenth-Century

9G7 Eighteenth-Century Fiction

novels by Defoe, Fielding, Richardson, Smollett, Sterne and Austen.

9G8 Individual Eighteenth-Century Novelist

Henry Fielding.

9H1 Romantic Poetry I

the First Generation: Wordsworth and Coleridge.

9H2 Romantic Poetry II

the Second Generation: Byron, Keats, and Shelley.

9H3 Problems of Romanticism

theoretical and historical concepts of Romanticism; defining imagination; the transition to Romanticism; critical readings of the Romantic poets.

9H8 Individual Romantic Writer

Ke. .

9J1 Victorian Poetry I

the study of Tennyson, Browning, Arnold.

9J2 Victorian Poetry II

the Pre-Raphaelite circle, the movement toward modernism: D. G. Rossetti, Burne-Jones, G. M. Hopkins, Hardy, Wilde.

9J5 Intellectual Prose of the Victorian Age

the relation between ideas and literary form in the major works of such writers as Carlyle, Newman, Arnold, Darwin, Ruskin, Pater, Carroll, Wilde.

9J7 Victorian Novel

the study of major works by Dickens, Eliot, the Brontës, Hardy.

9J8 Individual Victorian Novelist

recent critical approaches to the novels of Charles Dickens.

9K1 Early Twentieth-Century British Poetry

twentieth-century poets whose work has shaped the modern tradition, or extended our understanding of the traditions of the past: Hardy, Yeats, Lawrence, Muir, Auden, Owen, Thomas.

9K2 Contemporary British Poetry

Caves, Larkin, Hughes, et al.

9K3 Individual Modern British Poet

W. H. Auden. A study of Auden's achievement as poet, critic, dramatist, and translator, in the context of his age.

9K4 Twentieth-Century Irish Renaissance

the study of the emergence of a distinctive Irish literary tradition through concentration on the work of the main figures of the Irish Literary Revival, with particular emphasis on Yeats, Joyce, Synge, and O'Casey; minor concentration will be on post-Revolutionary and contemporary Irish writers: O'Faolain, O'Connor, and Behan.

30.9K7 Twentieth-Century British Fiction

Major figures of the modern and the contemporary periods: Conrad, Joyce, Cary, Orwell, Beckett, Compton-Burnett, Braine, Burgess, Fowles.

30.9K8 Individual Modern British Novelist

James Joyce and William Beckett.

30.9L1 Puritanism

Edward Taylor and Jonathan Edwards.

30.9L2 Literature of the New Republic

The beginning of the American literary tradition in poetry, fiction, and drama from Freneau to Cooper, 1765-1830.

30.9M1 Transcendentalism

From religious or metaphysical idealism to theories of self-transformation, with emphasis on Emerson and Thoreau and consideration of related figures such as Kant, Coleridge, Carlyle, William James, Mumford, Jung.

30.9M2 Nineteenth-Century American Poetry

The legacies of Whitman and Dickinson.

30.9M7 The Romance in America

An attempt to define American Romance through the study of Cooper's Leatherstocking novels, the major novels of Hawthorne and Melville's *Moby Dick* and *Billy Budd*.

30.9M8 The Rise of Realism

An examination of Local Colorism, Realism, and Naturalism in the works of Twain, Howells, James, Dreiser, Norris, and readings in European Realism.

30.9N1 Twentieth-Century American Poetry

Twentieth-century poets who have struggled to establish a tradition for American poetry and whose examples have dominated poetry up to the present: Robinson, Frost, Stevens, W. C. Williams, M. Moore, Eliot, Pound, Crane, Cummings, and the Fugitives.

30.9N2 Individual Modern American Poet

Wallace Stevens.

30.9N3 Contemporary American Poetry

Lowell, Bishop, Bronk, Roethke et al.

30.9N7 Modern American Novel

Comic Resistance: West, Ellison, Mailer, Hawkes, Barth. The exhaustion of possibilities and the post-modern idea of self.

30.9N8 Individual American Novelist

The Comic Faulkner.

30.9N9 Modern American Drama

Philosophic and aesthetic trends among such playwrights as O'Neill, William Miller, Albee, Simon, and others.

.9P4 The American 1890s

tensive study of the works of Stephen Crane with some attention to other writers of the period, including Howells, Frederic, Garland, and to the cultural milieu.

.9P5 Literature of the American South

study of the southern literary experience from early nineteenth century to mid-twentieth, from Simms to Faulkner.

.9P8 Art and Literature in the Victorian Period

Relationships of visual art, literature, and aesthetic theory in the Victorian period. Emphasis on Ruskin, Pre-Raphaelite circle, Pater, Whistler, Wilde.

.9P9 Twain and James

.9R1 Creative Writing I

ose fiction.

.9R2 Creative Writing II

ose fiction.

.9Z1 Thesis (maximum: 6 q.h.)

arrangement.

.9Z2 Directed Research

arrangement.

history

Professors

Raymond H. Robinson, Ph.D.,
Chairman
Philip N. Backstrom, Jr., Ph.D.
Wallace P. Bishop, Ph.D.

Charmarie J. Blaisdell, Ph.D.
Ballard C. Campbell, Ph.D.
William M. Fowler, Ph.D.
Gerald H. Herman, M.A.
John D. Post, Ph.D.
Martin R. Ring, Ph.D.

Associate Professors

Martha E. François, Ph.D.
Norbert L. Fullington, Ph.D.
Donald M. Jacobs, Ph.D.
Stanley R. Stembidge, Ph.D.

Lecturer

Helen S. Frothingham, M.A.

Assistant Professors

Donald R. Allen, Ph.D.

THE MASTER'S DEGREE

Admission

In addition to the admission requirements listed on page 20, applicant must have had a program which includes at least 15 semester hours of history. Applicants for the Fall Quarter who submit their application and all supporting documents by March 15 will be notified on or about April 1. Students who are interested in financial assistance *must* file all material by March 15.

Program

Forty-two quarter hours of academic work are required. Full-time students take four courses each quarter, thereby completing 36 quarter hours during the Fall, Winter, and Spring Quarters. The remaining credits may be taken during the summer sessions preceding or following the normal academic year.

All students must take the following courses:

23.800 Methodology and Theory
either 23.801 European Historiography or 23.900 American Historians

Two courses specifically labeled "seminar," except that students writing theses need take only one seminar.

Students must complete 23.800 prior to enrolling in seminars, and grades of at least B must be obtained in the seminars.

Students must complete at least one course (three quarter hours) in each of three areas: Group I, Europe; Group II, United States; and Group III, Other Regions.

Group requirements will not be satisfied by the historiography courses, 23.801 and 23.900, or by 23.894, 23.895, 23.896, 23.898, and 23.899. Courses are identified by group in the course list below.

With the approval of the faculty adviser, a maximum of nine quarter hours may be elected from graduate courses in other departments and a maximum of 12 quarter hours may be elected from advanced undergraduate courses in history.

A thesis is optional with the approval of the chairman of the department. If approved, a thesis carries nine quarter hours of credit.

In addition to the foregoing program leading to the M.A. in History, there may be other options available: one in American Studies and another in European Studies. Those interested in information about the proposed programs should contact the Department of History.

Comprehensive Examination

All degree candidates must pass a comprehensive examination.

Language Requirement

Proficiency must be demonstrated in a foreign language approved by the department.

Financial Aid

In addition to teaching and tuition assistantships, there is a scholarship in memory of Professor Robert A. Feer who was a member of the Department of History from 1963 to 1970.

DESCRIPTION OF COURSES

All courses carry three quarter hours of credit unless otherwise specified.

23.800 Methodology

The objectives, methods, and resources of the historian.

23.801 European Historiography

The development of historical writing from ancient times to the present.

23.802 Ancient Greece (Group I)

Selected topics in the history of ancient Greece.

23.803 Ancient Rome (Group I)

Selected topics in the history of Rome in the period of the Republic or the Empire.

23.806 Intellectual History of Europe, 1688–1789 (Group I)

The broad spectrum of eighteenth-century thought, with emphasis on scientific, religious, and political ideas.

23.807 Intellectual History of Europe, 1789–1870 (Group I)

The great age of liberal and nationalistic thought. Social problems created by industrialism and various proposals to solve these problems will be examined.

23.808 Intellectual History of Europe, 1870–1950 (Group I)

The intellectual developments which have brought Europe to its present position in world affairs. Topics considered include theories of evolution, scientism, radical socialism, and fascism.

23.809 Seminar in European Intellectual History (Group I)

Research and writing on special topics in European intellectual history.

23.810 Social History of Europe, 400–1350 (Group I)

A study of society in the "Age of Faith," with special emphasis on aspirations, way of life, and cultural achievement.

23.811 Social History of Europe, 1350–1650 (Group I)

A study of social structure, standards of living, aspirations and frustrations, and cultural achievement in an age of Black Death, Renaissance, and religious controversy.

23.812 Social History of Europe, 1650–1850 (Group I)

Exploration of social development and cultural achievement in an age of revolutions — intellectual, political, agricultural, and industrial.

23.813 Economic History of Europe since 1850 (Group I)

Topical analysis of the economic development of modern Europe.

23.817 Medieval Institutions (Group I)

Political, economic, and religious institutions in England and France from the fourth to the thirteenth centuries.

23.818 Seminar in the Renaissance (Group I)

Research and writing concerning the Renaissance.

23.819 Seminar in the Reformation (Group I)

Research and writing concerning the Reformation.

23.820 The Renaissance (Group I)

European political and cultural life from the thirteenth to the seventeenth centuries, with attention to Humanism and to the rebirth of classicism in literature and the arts.

23.821 The Reformation (Group I)

The development of the Christian Church from the thirteenth to the seventeenth centuries, with attention to the conflict between church and state, the impact of the Renaissance, the rise of the Protestant sects, and the wars of religion.

23.822 European Urban History to 1750 (Group I)

A study of urban places from Roman times to 1750 with special consideration of origins; layouts; political, economic, and social life; and the effects of town on society.

23.823 European Urban History since 1750 (Group I)

A study of urban places since 1750 with attention to the growth of population, industrialization, and bureaucratization and attendant problems.

I.826 English Medieval Constitutional History (Group I)

study of the traditions and institutions which contributed to the development of common law and parliamentary government from the time of Alfred through the reign of Henry VIII.

I.827 Seminar in England, 1558–1660 (Group I)

study of political, religious, social, and economic problems from Elizabeth I to the Restoration.

I.830 Britain, 1688–1815 (Group I)

Topics include constitutional evolution, political parties, social and economic change, religious and intellectual developments, cultural achievements, and Scotland and Ireland.

I.831 Britain, 1815–1914 (Group I)

Aspects of nineteenth-century Britain, including reform of parliament, liberalism and socialism, the Irish question, imperialism, and Victorian ideals and attitudes.

I.832 Seminar in Twentieth-Century Britain (Group I)

The seminar will focus on British political parties in the 1930s, with special emphasis on the development of their foreign policies.

I.833 Seminar in Nineteenth-Century Britain (Group I)

Liberalism, conservatism, and the progress of the English people will be the theme of the seminar.

I.835 France, 1180–1661 (Group I)

A history of France from the time of Philip II to the majority of Louis XIV with special emphasis on the problems of cultural, political, and economic unity and the effects of the Renaissance and the Reformation.

I.836 France, 1661–1830 (Group I)

A study of the "Old Regime," including an examination of the reign of Louis XIV, the decline of the French monarchy in the eighteenth century, and the general effects of the Enlightenment; an analysis of the revolutionary period, 1789 to 1830.

I.840 France and Germany, 1870–1918 (Group I)

Selected comparative topics in the Third French Republic and Wilhelmian Germany.

I.841 France and Germany since 1918 (Group I)

Selected comparative topics in French and German history since the First World War.

I.842 Seminar in Modern France (Group I)

Research and writing on a special topic or period in modern French history.

I.845 Seminar in Nineteenth-Century Europe (Group I)

Research and writing in European history from 1850 to 1900.

I.850 Seminar in Russian History (Group I)

A narrow period or special topic in Russian history. *The course presupposes a basic knowledge of Russian history and will require extensive work on a research paper.*

23.855 European Socialist Thought (Group I)

Studies in the history of socialism from the early nineteenth-century utopias to the New Left.

23.860 Diplomatic History of Europe, 1815–1914 (Group I)

The foreign policies of the chief European powers, with emphasis on changing alliances and alignments, imperialistic rivalries, and efforts at international cooperation.

23.862 Twentieth-Century Europe (Group I)

The political history of Europe since 1900, with attention to World War I, the rise of Communism and Fascism, the struggle for security in the western democracies, World War II, and the Cold War.

23.863 Seminar in Twentieth-Century Europe (Group I)

A study of a selected controversy in contemporary European History.

23.870 China to 1800 (Group III)

History of Chinese civilization from antiquity through Confucianism to the period of Western impact.

23.871 Modern China (Group III)

Revolution and institutional change in China from the nineteenth century to 1927.

23.872 Communism in China (Group III)

A study of the Chinese Communist movement from its origins in the 1920s to the present.

23.873 Japan to 1600 (Group III)

A survey of early Japanese history with special emphasis on the social, political, intellectual, and literary history of the medieval period.

23.874 Japan, 1600–1868 (Group III)

A study of the Tokugawa period, emphasizing the problems of late feudal control, urban and rural developments, social, intellectual, and literary history.

23.875 Modern Japan (Group III)

The history of Japan since the fall of the Tokugawa, emphasizing political and economic developments, especially after World War II.

23.881 Modern Africa (Group III)

A topical approach to the history of Africa since 1850.

23.883 History of the Islamic Peoples (Group III)

A study of the history, culture, and religion of the followers of Muhammad from 600 to 1800.

23.884 Modern Middle East (Group III)

A study of the Middle East in the twentieth century.

23.894 Seminar in History and Media

Students will explore such topics as the advantages and drawbacks of specific media, the uses and abuses of media in research and teaching, and the construction of media. Each student will participate in a research project involving the creation and/or evaluation of historically valid films, slide tapes, and other materials.

3.895 Approaches to World History

An interdisciplinary examination of the study of civilization emphasizing various methodologies and theories and testing them by studying specific historical periods and cultures.

3.896 Psycho-History

An introduction to the concepts, scholarship, problems, and directions of psychohistorical studies.

3.898 Population in History

An application of demographic theory to history.

3.899 Studies in Comparative History

The American image in Europe in the nineteenth and twentieth centuries.

3.900 American Historians

The writing of American history by Americans from colonial times to the present with emphasis on changes in both form and substance.

3.901 Recent Interpretations of American History (Group II)

The literature of American history since 1945.

3.905 Colonial America: The Seventeenth Century (Group II)

Exploration of the New World, settlement of the English North American mainland colonies, and the adaptation of European institutions and ideas to New World conditions.

3.906 Colonial and Revolutionary America: The Eighteenth Century (Group II)

The expansion of the English colonies in the New World, the development of political and social institutions, and the sources of friction with England.

3.909 Seminar in Colonial and Revolutionary America (Group II)

Research and writing on some topic in American history prior to 1789.

3.910 American Social History, 1607-1815 (Group II)

The ethnic foundation of American society; the ways Americans made their living, and the ways in which they lived during the colonial and early national periods.

3.911 American Social History, 1815-1900 (Group II)

The King Cotton society of the South, the ferment of reform and industrialism in the North, the Civil War, and the materialistic civilization of the late nineteenth century.

3.912 American Social History, 1900-1950 (Group II)

The transformation of the naive and idealistic America of the early twentieth century to life in a world in which technology has far outstripped man's mental and moral capacity to cope with it.

3.913 American Intellectual History, 1750-1865 (Group II)

American attitudes toward the individual and toward government during the Enlightenment, the romantic movement, and the slavery controversy.

3.914 American Intellectual History since the Civil War (Group II)

The adaptation of the ideas of an agricultural society to the conditions of an urban and industrial society.

23.915 Seminar in American Intellectual History (Group II)

The seminar will focus upon a single figure in American intellectual history. His writings and writings about him will be analyzed.

23.918 Seminar in American Cultural History (Group II)

Research and writing on some aspect of American culture.

23.920 Seminar in American Urban History (Group II)

The political, economic, and social history of America's major cities, with special emphasis on Boston's last century.

23.921 American Social Structure (Group II)

Survey of population, residential, family, ethnic, and class patterns in American history.

23.922 American Immigration and Ethnicity (Group II)

Analysis of immigration to the United States and its impact on American society.

23.924 Topics in American Reform (Group II)

Selected studies of movements to change aspects of American Society.

23.925 Seminar in American Economic History (Group II)

The development of the American economy from 1800 to the present, with special attention to the history of transportation. Topics include the development of highways, canals, railroads, and airlines, with an examination of the roles of private enterprise and government.

23.930 The Westward Movement in the United States in the Nineteenth Century (Group II)

Westward migration into the various geographic provinces will be traced, with emphasis upon its causes, processes, and its economic and political influences. Economic aspects stressed will be those relating to the land: agriculture, mining, lumbering, and grazing.

23.931 Man and Land in the United States in the Twentieth Century (Group II)

Aspects of land use in America since the closing of the frontier, with attention to agriculture and mining and to conservation programs.

23.935 Seminar in Recent American History (Group II)

Special topics from the period 1896 to 1960 will be studied in detail, and students will present a research paper on a major person, action, or movement.

23.937 American Politics, 1800-1877 (Group II)

The development of politics and parties in the nineteenth century.

23.938 American Politics, 1877-1920 (Group II)

Analysis of political patterns in the "transition" period.

23.939 Seminar in American Political History (Group II)

Research and writing on problems in American political history.

23.940 American Politics since 1920 (Group II)

Analysis of recent politics, emphasizing the Presidency, voting behavior, and party activity.

41 American Diplomatic History, 1775-1889 (Group II)

history of American foreign policy and foreign relations from the American Revolution to 1889.

42 American Diplomatic History since 1889 (Group II)

United States in the age of world involvement and responsibility; the imperialistic episode; the world wars; international organizations and alliances.

43 Seminar in American Diplomatic History (Group II)

Search and writing on selected topics in the history of American foreign relations.

45 Topics in the Civil War and Reconstruction (Group II)

Analysis of key issues surrounding the events leading up to the Civil War, the war itself, and the Reconstruction period.

67 Afro-American History I (Group II)

History of Afro-Americans to 1900, with emphasis on the role of black people in slavery and freedom.

68 Afro-American History II (Group II)

History of Afro-Americans since 1900.

69 Seminar in Afro-American History (Group II)

Search and writing on some aspect of Afro-American history.

70 The United States and the Caribbean Region (Group II)

Caribbean policy of the United States from the Monroe Doctrine to the present.

71 Mexican History (Group III)

making of modern Mexico from its Indian and Spanish beginnings to the present.

73 South America to 1900 (Group III)

European impact on South America, the movements for independence, and nineteenth-century history of the new republics.

74 South America since 1900 (Group III)

internal developments of the South American republics and their relations with one another and with other nations in the twentieth century.

75 Seminar in South American History (Group III)

Search and writing on special topics in the history of the South American republics.

990 Assigned Reading in History (1 q.h.)

Assigned reading under supervision of a faculty member.

991 Thesis (9 q.h.)

Thesis supervision by members of the department.

mathematics

Professors

David I. Epstein, Ph.D.
Chairman
Bohumil Cenkl, D.Sc.
Holland C. Filgo, Jr., Ph.D.
Arshag Hajian, Ph.D.
Flavio B. Reis, Ph.D.
Gabriel Stolzenberg, Ph.D.
Harold L. Stubbs, Ph.D.
Jack Warga, Ph.D.

Associate Professors

Samuel J. Blank, Ph.D.
Mark Bridger, Ph.D.
Alberto R. Galmarino, Ph.D.
Maurice E. Gilmore, Ph.D.
Eugene Gover, Ph.D.
Robert D. Klein, M.S.
Nancy J. Kopell, Ph.D.
Richard A. Rasala, Ph.D.
Thomas O. Sherman, Ph.D.
Victor R. Staknis, Ph.D.

Admission

In addition to the admission requirements listed on page 19, applicants should have a background which includes courses in linear and modern algebra and mathematical analysis.

THE MASTER'S DEGREE

Full-Time Program

Forty hours of course work are required for the degree. The following courses are required.

	Credits
10.9A1 Basic Analysis and Topology	4
10.9A2 Algebra A	4
10.9A3 Integration	4
10.9A4 Algebra B	4
10.9A5 General Topology	4
10.9A6 Complex Variables	4
10.9A7 Geometry	4

The remaining 12 credits required for the master's degree may be selected from any graduate mathematics courses with the approval of student's faculty adviser. In some cases, courses in other departments may be approved.

A full-time candidate for the master's degree will normally take the courses listed above in the first four quarters of graduate study, according to the following schedule:

Quarter	Credits	Winter Quarter	Credits
A1 Basic Analysis and Topology	4	10.9A3 Integration	4
A2 Algebra A	4	10.9A5 General Topology ..	4
Spring Quarter	Credits	2nd Fall Quarter	Credits
A4 Algebra B	4	10.9A6 Complex Variables .	4
A7 Geometry	4		

Part-Time Program

Students in this program may progress according to their abilities and time available. If students are deficient in any of the mathematics courses required for admission to the degree program, they will be required to satisfy their deficiencies by taking courses given for this purpose. Such courses will carry graduate credit, but the credit will be in addition to the regular degree requirements. The following courses are required:

	Total Credits
10.8C1 General Topology I	2
10.8D1, 10.8D2 Theory of Functions of a Real Variable I, II	4
10.8J1, 10.8J2, 10.8J3 Theory of Functions of a Complex Variable I, II, III	6
10.8P1, 10.8P2, Algebra I, II	4
	16

The remaining 24 quarter hours may be selected from graduate mathematics courses. With the approval of the department, a maximum of 10 of these elective credits may be selected from courses in other departments in the Graduate School of Arts and Sciences or the Graduate School of Engineering.

Other Requirements

There is no comprehensive examination and no language requirement for the master's degree. A thesis is not required but may in some cases substitute for an elective course with the approval of the department.

THE DOCTOR OF PHILOSOPHY DEGREE

mission

Students who have completed the first year of the full-time master's degree program or who have obtained a master's degree at another

institution are eligible for admission to the doctoral program. A student who wishes to earn the doctor's degree should inform the chairman of the graduate committee of his desire to be a doctoral candidate.

Residence Requirement

The residence requirement is satisfied by one year of full-time graduate work.

Degree Candidacy

Degree candidacy is established in accordance with the general graduate school regulations.

Qualifying Examination

A doctoral candidate will be required to do some sort of independent work during his second year of graduate study (see below). A candidate's performance in course work and in independent work will be used to judge whether he should continue in the doctoral program. After the second year, a student's adviser and the graduate faculty in general will monitor his work. He will be permitted to remain a doctoral candidate as long as his progress is satisfactory.

Course Requirements

The course requirements, in addition to the minimum master's degree requirements of 40 quarter hours of credit, are established by the departmental graduate committee for each candidate. In most cases, 40 quarter hours of additional work will be required.

Independent Work

A doctoral student in his second year of graduate study will be required to do some kind of independent project. The aim of the project is to start a student on independent work and to give him a practical way to learn research techniques. The student should, with the help of his adviser, choose a topic he wants to investigate. In studying his topic a student should read texts and journal articles and learn what to read and what not to read. In addition, he should try to solve problems, compute examples, modify proofs, and see whether or not the known results can be extended. A student should report on his work either in seminars or by giving a special lecture or writing up a short paper. The work of the project can in some cases be done in conjunction with departmental seminars or courses.

Minor Specialty

Each doctoral candidate will select some specific mathematical subject of an advanced nature and by means of reading, lecture courses and/or seminars master the equivalent of one full year's course work.

his area. Approval of the area in which the student intends to work should be obtained in advance from the Ph.D. committee. The topic must be reasonably unrelated to that area in which the student plans to write a dissertation.

Language Requirements

Ability to read and translate mathematical texts and journals in two foreign languages must be established by each candidate. The languages may be chosen from French, German, and Russian; any other choice requires special approval. The student should notify the chairperson of the departmental graduate committee when he is prepared to be examined on each language. At least one language examination must be passed before beginning work on the dissertation. The examinations are conducted by members of the faculty of the mathematics department.

Teaching Requirement

Some teaching experience is required. This requirement may be satisfied by at least one year of service as a teaching assistant or by suitable teaching duties.

Dissertation

After the successful completion of his independent work, each student shall select a dissertation adviser under whose guidance he will write his doctoral dissertation. If the student wishes it, the departmental graduate committee will assist him in the selection of a dissertation adviser. The dissertation itself must represent an original solution of a problem in the chosen area of mathematics which makes some contribution to mathematical knowledge.

Final Oral Examination

This examination on the dissertation will be held in accordance with graduate school regulations.

DESCRIPTION OF COURSES

The following courses are offered for those who wish to enter the master's degree program in mathematics, but who fail to satisfy the admission requirements in algebra and/or analysis. These courses will be taken in addition to the required course work in mathematics.

10B1, 10B2, 10B3 Abstract Algebra I, II, III (2 q.h.)

Groups, subgroups, normal subgroups, rings, ideals, integral domains, and fields. Prep. Differential and Integral Calculus.

10.8B4 Advanced Calculus I (2 q.h.)

Functions of one independent variable; limits, continuity, differentiability. Properties of continuous functions on a closed bounded interval. Rolle's theorem and the mean-value theorem. *Prep. Differential and Integral Calculus.*

10.8B5 Advanced Calculus II (2 q.h.)

Functions of several independent variables. Distance and open sets; limit continuity. Properties of continuous functions on a closed bounded set. Differentiability and differentials, mean-value theorem, implicit function theorem. Jacobians and transformations. *Prep. 10.8B4.*

10.8B6 Advanced Calculus III (2 q.h.)

Sequences, sequences of functions, uniform convergence, series. Integrations line and surface integrals. *Prep. 10.8B5.*

The following courses may be used toward the degree requirements mathematics.

10.8C1, 10.8C2 General Topology I, II (2 q.h.)

Sets and maps, metric spaces, topological spaces, separation axioms, compactness, connectedness. *Prep. 10.8B6 or equivalent.*

10.8D1 Theory of Functions of a Real Variable I (2 q.h.)

Lebesgue measure on real line, measurable functions, Lebesgue integral, convergence theorems, bounded variation, absolute continuity. *Prep. 10.8C1.*

10.8D2 Theory of Functions of a Real Variable II (2 q.h.)

Classical Banach spaces, integration theory on abstract measure spaces, signed measures, Radon-Nikodym theorem, product measure, Fubini theorem. *Prep. 10.8D1.*

10.8E1 Advanced Differential Equations I (2 q.h.)

First order differential equation; existence and uniqueness theorems; dependence of solution on parameter. Stability theory. Periodic solutions. *Prep 10.8B6.*

10.8E2 Advanced Differential Equations II (2 q.h.)

Systems of first order differential equations. *Prep. 10.8E1.*

10.8E3 Advanced Differential Equations III (2 q.h.)

Selected topics, including asymptotic behavior of situations. *Prep. 10.8E2.*

10.8E4 Partial Differential Equations I (2 q.h.)

Partial differential equations of first order; Cauchy-problem; Cauchy-Kowalewski theorem. Method of characteristics. *Prep. 10.8B6.*

10.8E5 Partial Differential Equations II (2 q.h.)

Classification of second order equations. Well-posed problems. Emphasis on hyperbolic equations. *Prep. 10.8E4.*

10.8E6 Partial Differential Equations III (2 q.h.)

Emphasis on elliptic equations. *Prep. 10.8E5.*

E7 Nonlinear Differential Equations (2 q.h.)

linear differential equations of the first order; systems of differential equations; singular points and stability; second-order nonlinear equations; results of Poincaré and Lyapunov; problems in nonlinear mechanics. *Prep. 10.8E3.*

E8, 10.8E9 Integral Equations I, II (2 q.h.)

Solutions of Volterra and Fredholm. Symmetric kernels. Orthogonal systems of functions. Applications. *Prep. 10.8B6 or equivalent.*

F1 Difference Equations (2 q.h.)

Numerical solution and solution of difference equations; approximate solution of engineering problems by finite-difference methods; relaxation techniques; stability and convergence of approximate methods; applications. *Prep. 10.8B6 or equivalent.*

F3, 10.8F4 Calculus of Variations I, II (2 q.h.)

Concept of the first variation of a functional; the simplest variational problem; Euler's equation. Generalization to several variables. Hamilton-Jacobi theory. Sufficient conditions for extrema. Fields of extremals. Direct methods in extremal problems. *Prep. 10.8B6.*

G1 Probability I (2 q.h.)

Fundamentals of probability theory; discrete and continuous probability distributions, including binomial, Poisson, and normal; law of large numbers and central limit theorem. *Prep. Differential and Integral Calculus.*

G2 Probability II (2 q.h.)

Further study of probability distributions for one or more random variables. Special topics such as occupancy problems and Markov chains. *Prep. 10.8G1.*

G4 Mathematical Statistics I (2 q.h.)

Fundamental statistical methods. Tests of significance and estimation based on large or small samples; simple correlation and linear regression. *Prep. 10.8G1 or equivalent.*

G5 Mathematics Statistics II (2 q.h.)

Analysis of variance; further topics in statistical inference. *Prep. 10.8G4.*

G6 Estimation Theory I (2 q.h.)

Review of probability with application to multidimensional random vectors. State space approach to dynamic systems with uncertainties. Estimation theory for static and dynamic linear systems based on Bayesian, maximum likelihood, minimum variance, Kalman-Bucy, and weighted least squares methods. Determination of optimal filter, predictor, smoother for discrete linear systems. *Prep. 10.8A4 and 10.8G1.*

G7 Estimation Theory II (2 q.h.)

Determination of optimal filter, predictor, smoother for continuous linear systems. Review of stochastic processes with application to estimation theory. Estimation theory for static and dynamic nonlinear systems. Introduction to hypothesis testing. *Prep. 10.8G6.*

10.8G8 Stochastic Processes I (2 q.h.)

Probability spaces for an infinite family of random variables. Gaussian processes. Processes with independent increments. Strict and wide sense stationary processes. Ergodicity. Random harmonic analysis. *Prep. 10.8G2.*

10.8G9 Stochastic Processes II (2 q.h.)

Markov chains with discrete and continuous time parameter. Markov processes. Counting processes. Renewal processes. Queuing problems. *Prep. 10.8G8.*

10.8J1 Theory of Functions of a Complex Variable I (2 q.h.)

Geometry of the complex plane, analytic functions, Cauchy's theorem. *Prep. 10.8C1 (may be taken concurrently).*

10.8J2 Theory of Functions of a Complex Variable II (2 q.h.)

Infinite sequences and series, singularities, residues, applications. *Prep. 10.8.*

10.8J3 Theory of Functions of a Complex Variable III (2 q.h.)

Meromorphic functions, Mittag-Leffler theorem, conformal mapping. *Prep. 10.8J2.*

10.8K1 Fundamental Questions of Mathematics: An Introduction to Mathematical Logic (2 q.h.)

A discussion of truth tables, propositional calculus with applications, theories and models, and Godel's incompleteness results. The course stresses the way in which Mathematical Logic raises and solves problems in number theory, theory, analysis, and geometry. *Prep. none.*

10.8K2 A First Course in Mathematical Logic (2 q.h.)

Propositional calculus, quantificational logic, first order theories through Skolem-Lowenheim Theorem. *Prep. none.*

10.8K3 An Introduction to Recursive Function Theory (2 q.h.)

Turing machines. Partially computable functions. Primitive recursive and general recursive functions and predicates. Unsolvable decision problems. Recursively enumerable sets of integers. The unsolvability of Hilbert's Tenth Problem. *Prep. none.*

10.8K4 Godel's Incompleteness Theorems (2 q.h.)

Formal number theory. Arithmetization. Godel's First and Second Incompleteness Theorems for formal number theory. *Prep. a knowledge of the methods of mathematical logic.*

10.8K5 Set Theory (2 q.h.)

The informal study of sets, including detailed discussion of the axiom of choice, well-ordered sets, and transfinite arithmetic. *Prep. none.*

10.8K6 Formal Set Theory (2 q.h.)

Versions of axiomatic set theory. The consistency of the continuum hypothesis and the axiom of choice. As time permits, the independence of the continuum hypothesis and the axiom of choice. *Prep. the equivalent of 10.8K2 and 10.8K5.*

L1 Numerical Analysis I (2 q.h.)

Solutions of systems of linear algebraic equations by reduction and iterative methods. Solutions of algebraic and transcendental equations. *Prep. 10.8B6 or equivalent.*

L2 Numerical Analysis II (2 q.h.)

Approximation and interpolation. Use of difference techniques in interpolation quadrature. Approximation by series of orthogonal functions; rational approximation. *Prep. 10.8L1.*

L3 Numerical Analysis III (2 q.h.)

Numerical solution of ordinary and partial difference equations with emphasis on stability and accuracy of solutions. *Prep. 10.8L2.*

L4 Linear Numerical Analysis I (2 q.h.)

Vector space, Jordan canonical form, norms and seminorms, direct solution of linear systems, special systems, error analysis, iterative methods. *Prep. 10.8B1 10.8B6.*

L5 Linear Numerical Analysis II (2 q.h.)

Iteration of iterative methods, the eigenvalue and eigenvector problem. *Prep. 10.8L4.*

L6 Numerical Solution of Partial Differential Equations (2 q.h.)

Applications of linear numerical analysis to the solution of partial differential equations. *Prep. 10.8L5.*

M1, 10.8M2 Approximation Theory I, II (2 q.h.)

Various techniques for the approximation of given functions, including interpolation, rational approximation, and orthogonal functions. Applications to such problems as numerical integration and solution of differential equations. *Prep. 10.8B6.*

M4 Interpolation and Approximation (2 q.h.)

Review of Taylor's theorem, elementary interpolation formulas, difference tables, Newton's formulas, lozenge diagram. Uniform approximation, Weierstrass theorem, Chebychev polynomials. Rational approximation, Padé table, Maehly's methods. *Prep. 10.8B6 or equivalent.*

M5 Approximation and Quadrature (2 q.h.)

Least-squares approximation, orthogonal functions, properties of orthogonal polynomials. Trigonometric approximation, filtering and smoothing. Numerical quadrature schemes, including Newton-Cotes, Gaussian and Romberg methods. Introduction to Monte Carlo methods and evaluation of higher dimensional integrals. *Prep. 10.8M4.*

M6 Numerical Solution of Ordinary Differential Equations (2 q.h.)

Existence of solutions of differential equations, direction field plots. One-step methods: Euler's method, second-order methods, Runge-Kutta schemes; multi-step methods: predictor-corrector methods, stability, automatic error control, results of Dahlquist, Butcher, Stetter, and Gragg. Higher-order equations and systems of equations. Introduction to boundary-value problems. *Prep. 10.8M5.*

10.8P1, 10.8P2, 10.8P3 Algebra I, II, III (2 q.h.)

The content of these courses is the same as 10.9A2 and the first part of 10.9A
Prep. 10.8B2 or equivalent.

10.8T1 Matrix Analysis I (2 q.h.)

Solutions of systems of linear equations by direct and iterative methods; matrix inversion, characteristic values, canonical forms. *Prep. 10.8B6 or equivalent.*

10.8T2 Matrix Analysis II (2 q.h.)

Discussion of Hermitian, orthogonal, and unitary matrices and their physical significance. Functions of matrices and matrix calculus. *Prep. 10.8T1.*

10.8T3 Tensor Analysis I (2 q.h.)

Tensor algebra; review of three-dimensional point and vector spaces in the setting of tensor analysis. Linear algebra and n-dimensional affine space. The coordinate tensor, tensor products, invariants, physical components. *Prep. 10.8B6 or equivalent.*

10.8T4 Tensor Analysis II (2 q.h.)

Symmetric and alternating tensors, rank and support, duality. The metric tensor. Tensor Calculus: curvilinear coordinates, tangent spaces. *Prep. 10.8T3.*

10.8T5 Tensor Analysis III (2 q.h.)

Tensor fields, covariant derivative. Riemannian geometry, geodesics, curvature tensor. Parallel displacement, linear connections, exterior forms. *Prep. 10.8T4.*

10.9A1 Basic Analysis and Topology (4 q.h.)

Sets and functions. Metric spaces with examples. Continuous functions. Notions of compact, complete, paracompact spaces. Function spaces, especially Banach and Hilbert spaces. Multilinear maps. Coordinate-free calculus, inverse and implicit function theorems, Taylor formula, first-order differential equations.

10.9A2 Algebra A (4 q.h.)

Groups, rings, modules: basic properties and examples. Linear algebra from an advanced standpoint; exactness and techniques of ring theory. Free group generators and relations, finitely generated abelian groups, Sylow theorem. Other topics as time permits.

10.9A3 Integration (4 q.h.)

Measure spaces. Abstract Lebesgue integral. Convergence theorems. Construction of Lebesgue measure on \mathbb{R}^n . Radon-Nikodym theorem. Product measure theorem. Fubini's theorem.

10.9A4 Algebra B (4 q.h.)

Polynomial functions and formal polynomials. Polynomial rings and unique factorization. Construction of extension fields. Splitting fields of polynomials. Theory of fields and Galois theory. Examples.

10.9A5 General Topology (4 q.h.)

General topological spaces. Moore-Smith convergence. Compactness and connectedness. Separation properties. Products. Quotient spaces. Inductive and projective limits. Function spaces. Elementary homotopy. Some of the functor viewpoint.

A6 Complex Variables (4 q.h.)

nary properties of holomorphic functions, harmonic functions, maximum principle, approximation theorems, conformal maps, zeroes of holomorphic functions, analytic continuation.

A7 Geometry (4 q.h.)

damental group, covering spaces, simplicial complexes, manifolds, orientation, linear group manifolds. Some attempt to tie up algebra and topology.

B3 Constructive Algebra (4 q.h.)

constructive development of some of the old familiar areas of algebra: principal ideal domains, Dedekind domains, factorial domains, Noetherian rings.

B9 Seminar: Constructive Analysis (4 q.h.)

ics in classical mathematics and analysis of them from the constructive viewpoint.

C1, 10.9C2 Functional Analysis A, B (4 q.h.)

ological vector spaces, Banach spaces, Hilbert spaces, algebras of operators, representations.

E1 Advanced Differential Equations (4 q.h.)

material of 10.8E1 and 10.8E2 is covered as a unit in 10.9E1. *Prep. 10.9A1.*

E3, 10.9E4 Partial Differential Equations A, B (4 q.h.)

ats a selection of the material of 10.8E4, 10.8E5, and 10.8E6. *Prep. 10.9A1 10.9A6.*

E6 Integral Equations (4 q.h.)

ers material from 10.8E8, 10.8E9. *Prep. 10.9A1.*

G1 Probability (4 q.h.)

bability spaces. Probability laws of families of random variables. Distribution functions and characteristics functions on R^n . Strong limit laws of sums of independent random variables. Central limit theorem. Conditional expectations.

GH1 Mathematical Statistics (4 q.h.)

s course embodies the material in 10.8G4 and 10.8G5. *Prep. 10.8G1 or equivalent.*

GM5, 10.9M6 Lie Groups and Fourier Theory A, B (4 q.h.)

ertain questions in analysis take on a special simplicity due to the benevolence of an algebraic structure. Starting with simple classical examples, the course will work toward a deeper and more contemporary vision of Lie groups and Fourier theory. Ideas will outweigh proofs.

GN1 Advanced Mathematics A (4 q.h.)

Legendre and Bessel functions, Laplace transforms, Fourier integrals, boundary-value problems, introduction to matrix algebra. *Prep. Differential Equations. Not to be used for credit toward the program in mathematics.*

10.9N2 Advanced Mathematics B (4 q.h.)

This course embodies the material in 10.8A3 and 10.8A4. Prep. 10.9N1.
Not to be used for credit toward the program in mathematics.

10.9P0 Seminar: Classical Groups (up to 4 q.h.)

Topics in classical groups as chosen by participants.

10.9P1 Representations of Groups (4 q.h.)

A basic course in group representations and character theory.

10.9Q1 Homological Algebra (4 q.h.)

Maps, sums, tensor products, exact sequences, homology, derived functors and adjoints, applications to algebra and topology.

10.9Q2 Module Theory (4 q.h.)

Techniques of commutative and homological algebra applied to modules and ideals. Applications to regular and Gorenstein rings.

10.9Q6 Ring Theory (4 q.h.)

A survey of ring theory. Commutative algebra and its geometric significance. Ideal and decomposition theory, semi-simple rings. Additional topics to be decided upon.

10.9U1, 10.9U2 Algebraic Topology A, B (4 q.h.)

Topics from: Homology groups, homology sequences, fiber spaces, sheaf products in homology and cohomology, cohomology algebra, Künneth theorems, Steenrod operations, Poincaré duality, higher homotopy groups and the Hurewicz theorem, characteristic classes.

10.9W1, 10.9W2 Dynamical Systems A, B (4 q.h.)

Structural stability and qualitative theory of dynamical systems.

10.9W9 Seminar: Dynamical Systems (up to 4 q.h.)

Topics in dynamical systems as chosen by participants.

10.9Z1 Master's Thesis (up to 6 q.h.)**10.9Z2 Readings in Analysis (up to 4 q.h. per quarter)****10.9Z3 Readings in Algebra (up to 4 q.h. per quarter)****10.9Z4 Readings in Topology (up to 4 q.h. per quarter)****10.9Z5 Doctoral Dissertation****10.9Z6 Seminar in Analysis (up to 4 q.h. per quarter)****10.9Z7 Seminar in Algebra (up to 4 q.h. per quarter)****10.9Z8 Seminar in Topology (up to 4 q.h. per quarter)**

physics

Professors

Roy Weinstein, Ph.D.
Acting Chairman
Ronald Aaron, Ph.D.
Petros N. Argyres, Ph.D.
Richard L. Arnowitt, Ph.D.
Alan H. Cromer, Ph.D.
Marvin H. Friedman, Ph.D.
Marvin W. Gettner, Ph.D.
Michael J. Glaubman, Ph.D.
Bernard Gottschalk, Ph.D.
Walter Hauser, Ph.D.
Giovanni Lanza, Ph.D.
Bertram J. Malenka, Ph.D.
Clive H. Perry, Ph.D.
Eugene J. Saletan, Ph.D.
Carl A. Shiffman, Ph.D.
Vogi N. Srivastava, Ph.D.
Michael T. Vaughn, Ph.D.
Eberhard von Goeler, Ph.D.
Thomas H. Wallace, Ph.D.

mission

Applicants for admission must have had, in addition to the requirements of the college, an undergraduate program which includes at least 18 semester hours of upperclass physics (beyond general physics) and courses in calculus and ordinary differential equations.

Students planning to enter graduate school should have in their upper-class undergraduate program the following courses or their equivalents:

- 11.200 - 11.201 Mechanics
- 11.211 - 11.212 Electricity and Magnetism
- 11.220 - 11.230 Thermodynamics, Kinetic Theory and Modern Physics
- 11.240 - 11.241 Quantum Mechanics

Students in advanced calculus, functions of a complex variable, Fourier series and boundary value problems. (The numbers correspond to Northeastern courses which are listed among the introductory courses below.) Students whose background in one or more of these areas is weak will be asked to satisfy the prerequisites to the required courses by taking up to 9 q.h. of introductory courses.

Associate Professors

Evangelos M. Anastassakis, Ph.D.
Robert I. Boughton, Ph.D.
David A. Garelick, Ph.D.
Hyman Goldberg, Ph.D.
William L. Faissler, Ph.D.
Robert P. Lowndes, Ph.D.
Pran Nath, Ph.D.
James E. Neighbor, Ph.D.
Jeffrey B. Sokoloff, Ph.D.
Allan Widom, Ph.D.
Fa Yueh, Ph.D.

Assistant Professors

David R. Earles, Ph.D.
Chian-Yuan Young, Ph.D.

Research Associates

Harald Johnstad, Ph.D.
Michael Jordan, Ph.D.
Huan Lee, Ph.D.
Douglas M. Potter, Ph.D.
Giulia Srivastava, Ph.D.
Neal E. Tornberg, Ph.D.

All students admitted to the program must be interviewed by the department and arrangements for a program of study must be concluded before registration. Appointments may be made in advance (though this is not usually necessary during regular office hours) by writing or calling the department [tel. (617) 437-2902].

The Program

There exists only one graduate program in the department, though some of our students are full-time, some are part-time, some leave with the M.S. and some continue on to the Ph.D.

The department is very active in research as evidenced by a publication rate of over 50 journal articles per year, a research support level of close to \$1 million per year, and an internationally established reputation in experimental and theoretical high energy (particle) and solid state physics. The research done in the department is basic research of high quality, and is of significance to the fundamental development of physics.

THE MASTER OF SCIENCE DEGREE

Course Requirements

Forty-two quarter hours (q.h.) of graduate credit are required, which up to 12 q.h. may be transfer credit on departmental approval and up to 9 q.h. may be in introductory courses.

The following courses are required, for a total of 30 q.h. of graduate credit:

11.820*, 11.825	Mathematical Methods A,B	(3 q.h.)
11.824, 11.826	Classical Mechanics A,B	(3 q.h.)
11.834, 11.835, 11.836*	Electromagnetic Theory A,B,C	(3 q.h.)
11.841, 11.842, 11.843	Quantum Theory A,B,C	(4 q.h.)

*NOTE: Only one of these two courses is required for the M.S.

Students may take as electives any courses carrying graduate credit in physics, mathematics, engineering, chemistry, psychology, or biology, for which the student has adequate preparation.

Detailed course descriptions are listed below.

Sample Programs for Part-time Students

YEAR	F	W	Sp	F	W	Sp	F	W	Sp
I	11.820	11.211	11.212	11.820	11.240	11.241†	11.820†	11.825	11.824
II	11.824	11.825	11.826	11.824	11.825	11.826	11.834	11.835	11.833
III	11.834	11.835	11.836† 11.240	11.834	11.835	11.836† 11.285†	11.841	11.842	11.844
IV	11.841	11.842	11.843	11.841	11.842	11.843	11.827†	11.828†	11.822

†Electives

THE DOCTOR OF PHILOSOPHY DEGREE

mission

A student's eligibility to take the Ph.D. qualifying examination is decided by a committee of the department on the basis of the student's overall performance. Full-time students will be notified of their status sometime in their second year of study. Students enrolled in the part-time master's degree program who wish to qualify for Ph.D. candidacy may so indicate by petition to the graduate committee of the department. The petition should include a timetable for completing the additional 33 (30 if he has had 11.836) quarter hours of required courses listed below and for taking the qualifying examination.

THE DOCTOR OF PHILOSOPHY DEGREE

The following courses are required in addition to the required courses for the M.S. degree:

11.827, 11.828, 11.829	Statistical Physics A,B,C	(3 q.h.)
11.836	Electromagnetic Theory C	(3 q.h.)
11.848	Advanced Quantum Theory	(4 q.h.)
11.86A, 11.86B, 11.86C	Particle and Nuclear Physics A, B, C	(3 q.h.)
11.87A, 11.87B	Solid State Physics A,B	(4 q.h.)

Notice that while these courses add up to 33 q.h., 12 q.h. of the total have been taken for the M.S., leaving only 21 q.h. of additional required courses for the Ph.D.

Sample Programs for Full-Time Ph.D. Students

Y	R	F	W	Sp	F	W	Sp	F	W	Sp
I		11.820	11.211	11.212	11.820	11.240	11.241	11.824	11.825	11.826
		11.824	11.825	11.826	11.824	11.825	11.826	11.834	11.835	11.836
		11.240	11.285†	11.241	11.834	11.835	11.836	11.841	11.842	11.843
II		11.834	11.835	11.836	11.841	11.842	11.843	11.827	11.828	11.829
		11.841	11.842	11.843	11.827	11.828	11.829	11.848	11.87A	11.87B
		11.827	11.828	11.829	Electives			11.86A	11.86B	11.86C
					Qualifying Exam					
III		11.848	11.87A	11.87B	11.848	11.87A	11.87B			
		11.86A	11.86B	11.86C	11.86A	11.86B	11.86C	Thesis Research		
		Electives			Electives					
		Qualifying Exam			Qualifying Exam					

IV Thesis Research and Advanced Electives

Qualifying Examination

The qualifying examination consists of a written and an oral part. The written examination covers the material in the required courses

plus suggested electives.

for the Ph.D. program. This examination is given twice a year, once in September and once in February. A student must take this examination during the next Fall Quarter following the quarter in which he becomes eligible to take it. If the examination is failed, it may be repeated for the second and last time on the next occasion it is given.

Residence Requirement

After a student has completed the required 63 q.h. (60 q.h. for students exempted from 11.820) of course work and has passed his qualifying examination, he becomes a doctoral degree candidate and must satisfy the residence requirement by one year of full-time graduate work.

Teaching Requirement

Some teaching experience is required. This requirement may be satisfied by at least one year of service as a teaching assistant or by suitable teaching duties.

Dissertation

The student should arrange for a dissertation adviser by the time he wishes to take the oral part of the qualifying examination. An outline of the dissertation must be approved by the departmental graduate committee at least eight months before the final dissertation examination (see below).

The student may choose his field of research according to one of the following options:

- a) In one of the research areas in the department, under direct supervision of his adviser.
- b) In one of the other research areas of the University, under the direct supervision of a researcher in that field. In that case, a joint committee including his direct supervisor, his departmental adviser, and one other member of the department will constitute his thesis committee.
- c) In an area of applied research in one of the industries or non-profit institutions associated with the department's Industrial Ph.D. Program. His direct supervisor will be an employee of the institution where the research is done (and will have been accredited by the physics department); the rest of the thesis committee will be as in option (b) above.

Final Dissertation Examination

This examination will be held in accordance with the graduate school regulations.

DESCRIPTION OF COURSES

INTRODUCTORY COURSES

00 Mechanics I (3 q.h.)

or analysis. Kinematics and dynamics of particle motion, generalized coordinates and Lagrange's equations of motion. *Prep. Basic Physics and Differential Equations.*

01 Mechanics II (3 q.h.)

Servation theorems, central force motion, systems of particles, rigid body motion, Hamilton's equations. *Prep. 11.200.*

08 Introduction to Mathematical Physics

Review of linear algebra and vector calculus, special functions and partial differential equations of physics, potential theory, functions of a complex variable. *Differential Equations.*

I1*, 11.212* Electricity and Magnetism I, II (3 q.h.)

o-quarter sequence in electromagnetic theory, Maxwell's equations and their experimental basis, electrostatics and magnetostatics, the electromagnetic field in empty space, electromagnetic waves, energy and momentum in the electromagnetic field, electrodynamics, the interaction of matter and the field, radiation. *Prep. 11.208.*

I0 Modern Physics (3 q.h.)

view of experiments demonstrating the atomic nature of matter, the properties of the electron, the nuclear atom, the wave-particle duality, spin, and properties of elementary particles. The course discusses, mostly on a phenomenological level, such subjects as atomic and nuclear structure, properties of the solid state, and elementary particles. *Prep. 11.200.*

I0* Quantum Mechanics I (3 q.h.)

first of a two-quarter sequence in quantum mechanics. Observations of microscopic and microscopic bodies. The uncertainty principle, wave particle duality, probability amplitudes, Schrodinger wave theory, and one-dimensional problems. *Prep. 11.208.*

I1* Quantum Mechanics II (3 q.h.)

Continuation of 11.240. Discrete and continuous states, Schrodinger equation in three dimensions, angular momentum, general theory of quantum mechanics, application. *Prep. 11.240.*

I5* Introduction to Nuclear Physics (3 q.h.)

Nuclear structure, nuclear masses, radioactivity, nuclear radiation, interaction of radiation and matter, detectors, fission, nuclear forces, elementary particles. *Prep. 11.230.*

I6, 11.847 Electronics and Data Analysis I, II (4 q.h.)

o-quarter course intended to teach those electronic and data-analysis techniques that are common to research in all fields of experimental physics.

These courses meet twice a week in the late afternoon or evening for 2 hours each time. The others usually meet 3 times a week in the day (except for 871, 11.872).

Subjects in electronics will be: principles of semiconductor devices; analysis techniques including feedback and servo loops, and wide-band amplification; digital techniques including integrated circuits and logic techniques; design of electronic subsystems such as counters, analog-to-digital converters and photodetectors. Subjects in data analysis will be probability theory; distribution functions; fitting data with a hypothesis; error estimation. Time permitting, high-vacuum techniques, cryogenic techniques, and lasers may also be covered.

11.871 Radiation Physics (2 q.h.)

Introduction to atomic and nuclear physics for graduate students in biology and pharmacy. Topics include quantum mechanics and atomic structure, nuclear structure, radioactivity, properties of nuclear radiation, detection of radiation.

11.872 Radiation Biology and Health Physics (2 q.h.)

The effects of radiation on biological systems and the uses of radiation in medicine and biological research. Topics include dosimetry, effects of radiation on chemical reactions; effects of radiation on cells, organs, and individuals; theories of radiation damage; imaging and tracer techniques using radioactive pharmaceuticals; radiation safety and standards. *Prep. 11.871.*

II. REQUIRED REGULAR COURSES (Offered every year)

11.820 Mathematical Methods A (3 q.h.)

Theory of functions of complex variable. Analytic functions. Taylor and Laurent infinite series. Analytic continuation and classification of functions. Calculus of residues. Asymptotic series. Applications to ordinary differential equations and the study of special functions.

11.825 Mathematical Methods B (3 q.h.)

Finite dimensional linear vector spaces. Matrices and determinants. Function spaces, Hilbert space and Hermitian forms. Linear integral equations. Completely continuous operators. Generalized Fourier expansions generated by solutions of the Sturm-Liouville problem. Linear response theory. Green's functions. *Prep. 11.820 or equivalent.*

11.824 Classical Mechanics A (3 q.h.)

Newton's law. Central force motion. Constraints and generalized coordinates. Lagrangian formulation. Hamilton's variational principle. Transformation symmetries. Small oscillations and normal modes. Scattering theory and cross-sections.

11.826 Classical Mechanics B (3 q.h.)

Rigid body motion. Hamiltonian formulation. Poisson brackets and canonical transformations. Hamilton-Jacobi theory. Lagrangian and Hamiltonian formalism of continuous media and fields. *Prep. 11.824.*

11.827 Statistical Physics A (3 q.h.)

The phenomenological theory of thermodynamics. Fundamental relations and thermodynamic potentials. Extremal principles of thermodynamics. Applications to simple systems. Stability conditions. Phase transitions. Thermodynamics of electric and magnetic systems. Principles of irreversible thermodynamics.

11.828, 11.829 Statistical Physics B, C (3 q.h.)

The principles of statistical mechanics and statistical thermodynamics. Density matrix. Theory of ensembles. Derivation of the laws of thermodynamics. Fermi

ic and Bose-Einstein statistics. Application to gases, liquids, and solids. Theory of phase transitions. Second-quantization formalism for interacting systems. Cooperative phenomena. *Prep. 11.827.*

134, 11.835, 11.836 Electromagnetic Theory A, B, C (3 q.h.)

Maxwell's equations. Static field and boundary value problems; multipole expansion. Phenomenology of dielectrics, conductors, and magnetic materials. Faraday's Law. Energy and momentum; Poynting vector; Maxwell stress tensor. Plane waves; polarization. Reflection and refraction; diffraction. Relativity. Radiation from sources. Motion of charged particles in electromagnetic fields; magnetic mirrors, particle accelerators. Introduction to plasma physics; magnetohydrodynamics. Radiation from accelerated charges; bremsstrahlung, synchrotron radiation. Scattering of radiation; interaction of radiation with matter. *Prep. 11.212, 11.820 (concurrently).*

41, 11.842, 11.843 Quantum Theory A, B, C (4 q.h.)

Experimental basis of quantum theory. Schrodinger equation and probability interpretation of wave mechanics. Uncertainty principle. Application to one-dimensional problems, the harmonic oscillator, orbital angular momentum, and central force problem. Quantum theory of scattering. Born approximation. Phase shift analysis. Introduction to S-matrix theory. General formulation of quantum mechanics in Hilbert space. Spin. Identical particles and symmetrization principle. Time-independent and time-dependent perturbation theory. Semiclassical theory of radiation and atomic spectra. Addition of angular momentum. Heisenberg-Eckart theorem. Quantum theory of radiation. Absorption, emission, and scattering of photons. *Prep. 11.240.*

48 Advanced Quantum Theory (4 q.h.)

Introduction to the formulation of a relativistic quantum theory. Study of the Dirac equation and its Lorentz covariance. Plane wave solution of the Dirac equation, and projection operators. Bound state solutions of the Dirac equation in Coulomb field, and the hydrogen atom. Parity, charge conjugation, and reversal symmetries. Propagator theory. *Prep. 11.843.*

6A, 11.86B, 11.86C Particle and Nuclear Physics A, B, C (3 q.h.)

The first quarter is a study of nuclear physics with emphasis on the nature of nuclear forces and its connection to particle physics. Phenomenological models are examined and compared with experimental results. The second and third quarters are a study of elementary particles and their interactions. A basic classification of elementary particles is made, along with a summary of their strong, weak, and electromagnetic interactions. Lorentz invariance and other symmetry principles are used to extract theoretical statements about scattering amplitudes, decay amplitudes, and particle mass spectra. *Prep. 11.843 and concurrent Prep. 11.848.*

7A, 11.87B Solid State Physics A, B (4 q.h.)

Classical approximation and theory of lattice vibrations of perfect crystals. Phonons, polaritons, and their measurement. One-electron approximation of metals and theory of Bloch electrons. Metals, semiconductors, and insulators. Thermal properties. Fermi electrons in external fields. Electron-phonon interaction. Electrical and thermal conductivity. Theory of transport phenomena. Magnetic properties. Amorphous solids. *Prep. 11.827, 11.842.*

III. ADVANCED ELECTIVES**11.804, 11.805, 11.806 Advanced Solid State Physics A, B, C (4 q.h.)**

Selected advanced topics in the theory of solids to be chosen each time by the interested students and instructor. E.g.: Theory of normal metals. Hartree Fock and Random phase approximations. Optical and transport properties of solid-phase plasmas. Raman spectroscopy. Quasiparticles and collective excitations. Quantum solids. Amorphous solids, etc. *Prep. 11.829, 11.841, 11.87B.* Offered every other year.

11.857, 11.858, 11.859 Many-Body Theory A, B, C (4 q.h.)

Introduction to some many-body problems and the required mathematical techniques. Theory of linear response and correlation functions. Landau theory of Fermi liquids and applications to solids. Theory of superconductivity and superfluidity. General theory of Green's functions and diagrammatic techniques. *Prep. 11.829, 11.843, 11.87B.* Offered every other year.

11.854, 11.855, 11.856 Fields, Particles, and Currents A, B, C (4 q.h.)

Introduction to a local field theory. Symmetries of the Lagrangian and conservation laws, Lorentz group, spin, and helicity. P, C, and T. Klein-Gordon-Dirac, vector meson and photon fields. The S-matrix and LSZ reduction formulae. Spectral representations. Feynman diagrams. Green's functions at large Euclidean momenta. Renormalization and finiteness. The renormalization group and asymptotic freedom. Gauge theories, spontaneous breaking of a Higgs phenomenon. Weinberg's unified theory of weak and electromagnetic interactions. Currents. *Prep. 11.848.*

11.837 Electromagnetic Theory D (3 q.h.)

Advanced topics in electromagnetic theory such as problems involving radiation reaction, energy, momentum, and the equations of motion of a high-speed particle, Cerenkov radiation, the Lagrangian and Hamiltonian formulation of electromagnetism. *Prep. 11.836.*

11.838, 11.839 General Relativity A, B (3 q.h.)

A brief survey of differential geometry, physical basis of the Einstein equations, simple solutions and experimental tests, cosmology, asymptotic properties of the Einstein equations (radiation, energy, momentum), quantization of the theory. *Prep. 11.837 and 11.826.*

11.91A, B, C (1 q.h.)**11.92A, B, C (2 q.h.)****11.93A, B, C (3 q.h.)****11.94A, B, C (4 q.h.)**

Reading course, or theoretical or experimental work under individual faculty supervision. *Prep. Consent of faculty member.*

11.995 Doctoral Dissertation

Experimental and theoretical work for Ph.D. candidates.

Political science

Professors

David W. Barkley, M.P.A., Ph.D.
John Gregg Wilfong, Ph.D.

Associate Professors

George E. Berkley, Ph.D.
Gerald Bursey, Ph.D.
Robert L. Cord, Ph.D.
Robert E. Gilbert, Ph.D.
Clinton F. Goldman, Ph.D.
Walter S. Jones, Ph.D., Chairman
James A. Medeiros, Ph.D.
David E. Schmitt, Ph.D.
Steve Worth, Ph.D.

Assistant Professors

Ennis R. Goldenson, M.A.
Ethel I. Hirshon, Ph.D.
Juzanne Ogden, Ph.D.
Endell C. Lawther, M.A.

Mission

In addition to the admission requirements listed on page 20, applicants for the Master of Arts program should have had a background which includes at least 15 semester hours of political science or government. All applicants must take the Graduate Record Examination.

Applicants for the Master of Public Administration program should demonstrate a clear and strong interest in public administration. All applicants for admission must furnish a statement that supports his or her interest in public administration and provides reasons for wishing to enter this program. Although it is anticipated that most candidates for this program will come with a major concentration in the social sciences, this is not mandatory, and applicants from other fields such as engineering, law, the sciences, and business administration will be considered for candidacy.

Lecturers

Elizabeth D. Bennett, S.M.
Gordon Bowen, M.B.A.
Thomas J. Cahill, Ph.D.
Ernest W. Cook, Ph.D.
Richard M. Doherty, M.A., J.D.
Kevin T. Fitzpatrick, M.B.A.
W. Arthur Gagne, Jr., S.B., M.B.A.
Richard Gladstone, M.A., M.C.P.
Harry Grossman, L.L.B.
Demeter J. Kollias, M.P.A.
Ronald E. Lawson, M.B.A., M.P.A.
Robert H. McClain, Jr., M.P.A.
Harold J. Mezoff, M.P.A.
Walter W. Mode, M.P.A.
Robert J. M. O'Hare, M.S.
Richard A. Siegel, Ph.D.
Marvin Siflinger, M.P.A.
William A. Sommers, M.P.A.
Wallace Stickney, M.S.
Richard E. Wall, M.A.
John S. Warren, M.P.A.
John A. Wolaver, M.B.A., M.U.A.

THE MASTER OF ARTS DEGREE

Program

Forty-two quarter hours of academic work are required. With the approval of the faculty adviser, a maximum of nine quarter hours may be elected from graduate courses in other departments and a maximum of eight quarter hours may be elected from advanced undergraduate courses.

A thesis is optional with the approval of the chairman of the department. If approved, a thesis carries six quarter hours of credit.

Comprehensive Examination

This examination will be held in accordance with the general graduate school regulations. Every candidate for the degree must pass examinations in two fields as prescribed by the department. Choice may be made from the following fields: American Government, Comparative Government, International Relations, Political Theory, or Public Administration.

THE MASTER OF PUBLIC ADMINISTRATION DEGREE

Program

Forty-two hours of academic work are required. All students must complete the following five courses:

- 22.871 Public Budgeting
- 22.872 Public Fiscal Management, or
- 22.874 Functions and Techniques of Public Management
- 22.880 Survey of Public Administration
- 22.882 Public Personnel Administration
- 22.885 Quantitative Methods in Public Administration

At least five additional courses must be selected from courses designated public administration electives. Not more than four courses may be selected from other graduate courses offered by the department or the University, and these must have the approval of the faculty adviser.

Comprehensive Examination

A candidate for the degree must pass a general examination in the field of public administration as a whole which will test both mastery of the literature and the ability to apply concepts in the field to concrete problems of government.

DESCRIPTION OF COURSES

All courses carry three quarter hours of credit unless otherwise specified.

All courses are seminars.

22.800 American Government

Analysis in depth of selected problems in American government. Examples of problems are: transition of American political parties, legislative reapportionments, and the decline of Congress as a law-making body. *M.P.A. elective.*

I10 Models of Political Systems.

detailed examination and critique of current models of political systems.

I12 Political Psychology and Socialization

examination of theories of political psychology, opinion formation and attitude change; of political ideology; of processes of individual political development and socialization; of effects on mass and elite political behavior; of cultural differences and differential socialization experiences; of individual political behavior and the political system.

I15 Politics and the Mass Media

udy of the role of mass media in the formation of public opinion, with special attention to use of the media in the electoral process.

I20 Legislative Process

udy of Congress and of the influence of the President, administrative bureaus, parties, interest groups, and public opinion on the development of legislative policy. Comparisons will be made with legislative process in the states. *M.A. elective.*

22 American Constitutional Law

Employing excerpts of U.S. Supreme Court decisions and other primary legal materials, this course examines the constitutional rationale for judicial review; various philosophical approaches to the exercise of judicial power; and the scope of judicial authority to settle questions challenging the legitimacy of governmental actions in the American constitutional system.

23 American Constitutional Law II

Using excerpts of primary legal materials, this course builds upon the judicial doctrines developed in 22.822 and specifically examines the constitutional theories behind the growth of congressional prerogatives in economic and fiscal affairs, and expanding presidential power in internal and foreign matters. *Prerequisite: 22.822 or consent of the instructor.*

24 The Presidency

Examination of the place and function of the chief executive in the formulation and execution of public policy. *M.P.A. elective.*

I26 American Electoral Behavior

The theoretical and methodological assumptions of election studies of the American political system will be analyzed and the substantive conclusions carefully reviewed.

I27 Campaigns and Elections.

A study of campaign tactics and strategies. Field Work required.

I28 The Judiciary

Analysis of the role of the judiciary in the American governmental process. Special attention is given to those areas of constitutional law where the Court's decisions have a profound impact on the basic structure of American politics (separation of powers, economic regulation, federalism, etc.).

22.830 Civil Rights

Examination of the doctrine of constitutionalism illustrated and amplified by a study of the substance and process of the Bill of Rights as developed in decisions of Federal courts, and Congressional enactments.

22.831 Procedural Due Process

Utilizing excerpts from U.S. Supreme Court decisions and other legal materials, this course examines the philosophical and constitutional relationships between Amendments 4, 5, 6, 8 and the Fourteenth Amendment. The substance of the right to fair trial, counsel, confrontation, protection against self-incrimination and unreasonable searches and seizures are among the many procedural rights examined through the decisions of the Roosevelt, Vinson, Warren, and Burger Courts.

22.832 Intergovernmental Relations

An institutional-behavioral analysis of the changing relationship between the various levels of American government — national, state, and local — relating this pattern of change to the social and economic forces which underlie it. *M.P.A. elective.*

22.834 Constitutional Law

A case development in the basic structural aspects of the American constitutional system including an evaluation of federalism, separation of powers, and the formal and informal processes of amendment and constitutional change.

22.835 Administrative Problems in Criminal Justice

An examination of the criminal justice system in the United States with particular emphasis on political and administrative factors. Emphasis on the role of police, courts, judges, juries, parole, probation and incarceration. *M.P.A. elective.*

22.836 Federal Bureaucracy

Examination of dynamic and structural aspects of the national government, with attention to the place of the national administration in the federal system. *M.P.A. elective.*

22.837 Local Government and the New Federalism

An examination of problems of local government in the light of new patterns of intergovernmental relations. *M.P.A. elective.*

22.838 Bureaucracy and Public Control

An analysis of problems of democratic control in American administration. Topics include technological change, size and complexity, executive-legislative relations, interest groups, and political culture. Stress upon problems for administration in dealing with the multiple pressures of a complex, democratic political system. *M.P.A. elective.*

22.839 Systematic Policy Making

A systematic approach to public policy making, its planning and implementation. Policy making in currently significant subject areas will be discussed and made the basis for illustration of sequential procedures and systems techniques. *M.P.A. elective.*

840 Problems in State Government

praisal of the problems of contemporary state government in the U.S. Particular emphasis is given to the state government of Massachusetts. Individual research is stressed. *M.P.A. elective.*

841 Problems in Urban Planning

exploration of the devices available to the urban planner for policy implementation, including zoning, subdivision regulation, and capital improvement programs. Special emphasis is given to the planning of individual sites. *M.P.A. elective.*

842 Techniques of Urban Planning

study of the history and techniques of city planning, stressing the elements of planning. *M.P.A. elective.*

843 The Politics of Urban Planning

investigation of the relationships of planning to other governmental functions with stress on practical processes, particularly at the municipal government level. *M.P.A. elective.*

844 Urban Government

contemporary crisis in urban government—problems of political independence, government finance and administration, rapid growth of suburban and metropolitan areas, and decline and decay of the core city are stressed. Particular emphasis is given to the Boston metropolitan area. Individual research is stressed. *M.P.A. elective.*

845 Problems of Municipal Administration

selected case problems and topics in municipal administration including organization, financial management, personnel and labor relations, municipal services, and public and political relations. Individual research is stressed. *M.P.A. elective.*

846 Problems of Regional and Urban Development

examination of the role of government and politics in the planning, programming, and administration of regional and urban development in the United States. Consideration is given to urban renewal; interurban and interregional competition; interstate compacts; public authorities; T.V.A., Appalachia, and New England regional development; anti-poverty programs; and conflicts between public and private interests. Individual research is stressed. *M.P.A. elective.*

847 The Politics of Transportation

examination of the role of politics, governmental mechanisms and public policy in the transportation planning process. Particular attention is given to political interest groups and the manner in which they affect transportation policy on the federal, state and local levels. *M.P.A. elective.*

848 Problems of Urban Renewal

examination of the role of government, politics, and public policy in the urban renewal process and related problems of housing in the United States. *M.P.A. elective.*

22.849 Urban Management and Systems Planning

A non-technical, step-by-step application of systems and computer technology problems in urban management. *M.P.A. elective.*

22.850 Comparative Politics I

Comparative analysis of politics and political systems with special attention fundamental problems of theory and practice. The chief focus is on contemporary political systems and contemporary theories in the field of comparative politics. Traditional models are also treated, but more briefly. Particular attention will be paid to British and American political experience.

22.851 Comparative Politics II

Extends and intensifies the comparative analysis of politics undertaken in Comparative Politics I by examining a broader range of institutional experience. Special attention will be given to European political experience, particularly that of France and Germany. *Prep. 22.850.*

22.853 Crisis Politics in Democracies and Dictatorships

Analysis of governmental response to crises and emergencies. Consideration of such topics as war powers, riots and rebellions, martial law, transfer of régime, succession problems, economic crises, presidential emergency powers, national security powers, executive privilege, impeachment, etc.

22.854 Totalitarianism

An analysis of totalitarianism and dictatorship including study of historical background; fundamental characteristics; theories of origin, nature, and significance; and evaluation of techniques, ideologies, policies, and instruments of power. Special attention will be given to the government and politics of the Soviet Union.

22.855 Government and Politics in Germany

A study of political culture, federalism, and executive-legislative relations at the national level with a view to appraising the quality and durability of the present democratic system.

22.856 Government and Politics of France

A study of governmental organization and political behavior in France today. Special attention is given to the role of the presidency, executive-legislative relations, and the political party system.

22.858 Government and Politics of the United Kingdom of Great Britain and Northern Ireland

An analysis of government organization and political behavior in the United Kingdom. Special attention will be given to executive-legislative relations, the political party system, and the politics of Northern Ireland.

22.860 Collective Bargaining in the Public Sector

Study of the mechanisms for labor relations in federal, state and local government with its impact on the public manager. Emphasis is placed upon collective bargaining processes, tactics, and techniques. *M.P.A. elective.*

.861 Grantsmanship

struction in ways to prepare well-conceived, adequately documented, and logically developed grant proposals. Consideration will also be given to the political strategies of proposal submission. *M.P.A. elective.*

.865 Computer Techniques in Public Administration

Introduces nonspecialists to the uses of computers for management purposes, with special attention to their use in federal, state and local governments. Attention will be given to computer use for planning and problem solving, as well as data processing. *M.P.A. elective.*

.868 Politics and Health Care Administration

An examination of the politics and administration of health services delivery systems, including a discussion of current topics in health care administration and politics (e.g., national health insurance, health maintenance organizations, physician assistants, citizen participation, administrative decentralization), and introduction to current developments in policy evaluation methodology and health services research.

.871 Public Budgeting

Emphasizes the public budgeting function in its relationship to other functions of public administration. Business budgeting in contrast with public, conflicting legislative, and executive interests are examined; illustration is given of the budget cycle and the mechanics of budget preparation; attention is given to means for improving budget decision-making and administration with use of quantitative and other methods.

.872 Public Fiscal Management

A study of the interrelationships in public administration between systems of finance and the achievement of program objectives. Emphasis is placed upon those aspects of the budgetary process that bear on fiscal policy and appropriations.

.873 Systematic Analysis and Public Finance

A conceptual examination of the Planning, Programming and Budgeting System (PPBS) and its application to the decision-making and budgetary processes in the public sector. An overview of the elements of the system and their application in determining optimum allocation of public funds. Specific examples will be discussed. *M.P.A. elective.*

.874 Functions and Techniques of Public Management

An introduction to problems in public management and techniques for dealing with them. This will include functions of middle management, supervision, administration of staff activities (e.g. planning, personnel, budget), organization and methods, public relations, managerial use of computer-based techniques, and tactics and strategies of management.

.875 Administrative Procedures in Democratic Society**.876 Administrative Behavior**

An analysis of the sociological and psychological aspects of organization and management. Topics include: bureaucratic leadership; interaction of individual and organization; dynamics of the small group; pathology of bureaucratic behavior. *M.P.A. elective.*

22.877 Public Policy and Environmental Control

Consideration of the legal, political, administrative, and intergovernmental factors involved in the formulation of public policy and the exercise of power in regulating the use of the environment. Individual research is stressed. *M.P.A. elective.*

22.878 Research in Public Administration

Development and application of research designs in public administration. *M.P.A. elective.*

22.879 Science, Technology, and the Administration of Public Policy

An analysis of central administrative and policy issues raised by the interrelationships of science and public affairs. Some issues to be discussed: effects of technological development upon the development of policy alternatives and their implementation; national policy for support of science and technology; the administrative role of the expert. *M.P.A. elective.*

22.880 Survey of Public Administration

Introduction to the literature and the major topics in public administration with special attention given to the interrelationships of politics and administration.

22.881 Special Issues in Public Personnel Administration

Selected issues and problems will be examined in depth. *Prep. 22.882. M.P.A. elective.*

22.882 Public Personnel Administration

Technique, practice, and organization of personnel functions in public administration, including recruitment, compensation, training, discipline, and relations with employee organizations.

22.883 Comparative Public Administration

A comparative study of the approaches to public administration in selected democratic governments in the United States and Europe. *M.P.A. elective.*

22.884 Comparative Metropolitan Government and Politics

An examination of structure, administration, and politics of selected major European cities in the context of the metropolitan problem in the United States with special emphasis on problem solution and comparative administration. *M.P.A. elective.*

22.885 Quantitative Methods in Public Administration

Application of statistical techniques to Public Administration. *M.P.A. elective.*

22.887 Regionalism and Regional Administration

An examination of the growth and development of intrastate and interstate regional councils, together with their relations with local, state, and federal governments. Examples throughout the nation will be studied, and a detailed analysis made of regional councils in Massachusetts. *M.P.A. elective.*

22.888 Administrative Law

Study of rule-making, adjudication (formal and informal), administrative final and judicial review, administrative procedure, scope of administrative power, and enforcement techniques.

2.889 Governmental Accounting

Examination of principles and procedures involved in governmental accounting.
M.P.A. elective.

2.890 Research Seminar in Public Administration

Will require each student to develop and report upon an individual research project in public administration. This seminar will normally be taken in the last quarter of study for the M.P.A. degree.

2.895 Motivation and Management

An examination of current sociological and psychological theories on the subject of motivations of individuals in organizations and of the effects of their application. *M.P.A. elective.*

2.900 Ancient and Medieval Political Thought

The development of political thought from Greek antiquity to the end of the Middle Ages. Both historical and analytical approaches will be utilized. Attention is also paid to the cultural, social, and intellectual context within which political theories develop.

2.910 Modern Political Thought

Examination of political thought from Machiavelli to Marx.

2.920 Contemporary Political Theory

The main currents of political thought in the latter half of the nineteenth and the twentieth centuries with special emphasis on the relations between political theory, philosophy, and political science.

2.922 The Measurement of Political Events

The purpose of this course is to acquaint political science majors with some analytical and mathematical tools appropriate for use in studying politics.

2.924 Strategy in Politics

An examination of formal theories of political behavior, stressing elements of strategy and their implications. Relationships between political actors, patterns in political processes, bargaining, decision making, and voting will be covered.

2.926 Trends in American Political Thought

Examination of intellectual concepts and movements that have informed and influenced American political life with emphasis upon those relating to the making and execution of public policy. *M.P.A. elective.*

2.928 Organization Theory

An in-depth study of the major organization theories including the scientific basis for organization theory; models and ideal types; decision-making; application of game theory; systems analysis. *M.P.A. elective.*

2.929 Organizational Analysis and Change

A study of the structure and processes of organization essential for problem-solving and for effecting organizational change. Emphasis is placed upon the application of social science theory and administrative principles in administrative problem identification and problem resolution. *M.P.A. elective.*

2.930 Positive Political Theory

An examination of the works of Anthony Downs, William Riker, and others in his current school of political analysis.

22.942 Asia and the Politics of Development

This course relates the theoretical literature on political development to the concrete attempts to develop in Asia. Because of the diversity in levels and types of political development in Asian states, each student is encouraged to concentrate on one state and explore different ideas about political development within the context of that state.

22.943 The Governments and Politics of Latin America

This course investigates contemporary Latin American politics with particular emphasis on militarism, revolution, executive dominance, and social change. It then focuses on three representative nations such as Mexico, Argentina, and Cuba.

22.944 Nationalism

The evolution and role of nationalism in both theory and practice. Representative nationalistic movements and theories are analyzed.

22.946 The Politics of Revolution and Change

Analysis of the nature of political change with attention to both theory and practice. Topics discussed are revolution, major trends in contemporary politics and the relationship between political change and technological, scientific, or social change.

22.948 Government and Politics of North Africa and the Middle East

Comparative analysis of the political systems and foreign policies of African states north of the Sahara. Also stressed is the relationship of this area with the Middle East.

22.950 United States-Soviet Relations

The relations between the United States and the Soviet Union from 1917 to the present. Topics stressed are: the "nonrecognition" period, the breakdown of the World War II "Grand Alliance," and the nature of the present power conflict.

22.951 United States-Far Eastern Relations

American diplomacy in the Far East, with primary concentration on Japan since World War II, the two Chinas, and Southeast Asia.

22.952 Communist China's Foreign Policy

A study of the Peking government's relations with Afro-Asia, the Soviet orbit and the West. Attention is given to policy objectives, strategy, tactics, and the method of decision making in both the party and state apparatus.

22.954 Soviet Relations with Eastern Europe

An analysis of Soviet policy in Eastern Europe, especially Russian efforts after World War II to develop communism and maintain a position of pre-eminence in this region.

22.955 Chinese Politics

This course concentrates on the objectives of the Chinese revolution from 1911 to the present. It examines the political theory and institutions which have been established to promote "permanent revolution" and evaluates the "rationality" of Chinese Communist policies in terms of Chinese goals.

2.956 Government and Politics in Sub-Saharan Africa

Comparative analysis of the political systems and foreign policies of selected African states south of the Sahara. Special attention is given to the Republic of South Africa and its policy of apartheid.

2.958 The Formulation and Conduct of American Foreign Policy

The governmental mechanism for foreign policy formulation and its conduct. Problems in decision making and execution are emphasized.

2.959 American Foreign Policy

Examination in depth of selected issues concerning the role of the United States in world affairs since 1945.

2.960 Problems of World Order I

Emphasizes such topics as appraisal of diverse systems of public order, approaches of international law and international organization to the problem of world order, and the problem of world peace enforcement.

2.961 Problems of World Order II

Continuation of 22.960: political problems of world order are stressed. Representative topics considered are arms control, disarmament, strengthening the United Nations, and evaluation of world government proposals. Prep. 22.960.

2.964 The United Nations

Selected topics on the "non-political" work of the United Nations: human rights; economic, social, health and related problems; decolonization and the trusteeship system.

2.966 International Law

Examination of selected topics in International Law not covered in 22.960 and 2.961.

2.967 Regional Organization

A study of international organization at the regional level, concerned with examining the capability of institutions to foster integration of policy and authority, and with the effect of this progress upon broader international cooperation.

2.968 The Atlantic Community

A topical analysis of European-American diplomacy from the Marshall Plan to the present, with attention to security matters, United States policy regarding the European integration movement, the Anglo-American "special relationship," the Franco-American discord, and the German dilemma. Continuing focus will be upon Europe as part of the global diplomacy of a superpower as world politics assumes a multipolar configuration.

2.969 The United States and the United Nations

A study of the pursuit of American foreign policy through the United Nations, with emphasis on the uses and effects of parliamentary diplomacy.

2.990 Assigned Reading (maximum: 6 q.h.)

Assigned reading under supervision of a faculty member.

2.991 Thesis (6 q.h.)

Thesis supervision by individual members of the department.

psychology

Professors

John C. Armington, Ph.D.
Harlan Lane, Ph.D., Doc. ès Lettres
Chairman
Helen Mahut, Ph.D.
Bertram Scharf, Ph.D.
Murray Sidman, Ph.D.
Harold S. Zamansky, Ph.D.

Associate Professors

Edward A. Arees, Ph.D.
Roger F. Brightbill, Ph.D.
Perrin S. Cohen, Ph.D.
Charles Karis, Ph.D.
Harry A. Mackay, Ph.D.
Michael Terman, Ph.D.

Assistant Professors

Martin Block, Ph.D.
Karen Busby, Ph.D.
Isaac M. Colbert, Ph.D.
Thomas Corwin, Ph.D.
François Grosjean, Ph.D.
Alexander A. Skavenski, Ph.D.

Senior Research Associates

Leila R. Cohen, Ph.D.
Juian S. Terman, Ph.D.

Research Associates

Matthias Korth, M.D.
Stuart M. Zola, Ph.D.

Admission

In addition to the admission requirements listed on page 20, applicants are expected to have had at least 15 semester hours of psychology, including experimental psychology and statistics. This requirement may be waived in some cases. The Miller Analogies Test is desirable but not required. All application materials must be submitted prior to February 1 of the year in which the applicant plans to begin study. The Graduate Record Examination should be taken by December 15 to insure completion of admissions credentials by February 1.

THE MASTER'S DEGREE

The master's degree is usually taken en route to the Ph.D. Requirements for this degree are 42 quarter hours of academic work including research for six quarter hours of credit, and passing the written qualifying examination as outlined below. The academic work, planned as an integral part of the doctoral program, is outlined on the following pages.

THE DOCTOR OF PHILOSOPHY DEGREE

Residence Requirement

The residence requirement is satisfied by one year of full-time graduate work after admission to doctoral candidacy.

Degree Candidacy

Degree candidacy is established in accordance with the general graduate school regulations.

Qualifying Examination

The qualifying examination consists of evaluation of written materials based upon proseminar discussions.

Course Requirements

A minimum of 27 quarter hours of academic work beyond those required for the master's degree is required. The nature and number of courses must be approved by the adviser and the departmental graduate committee. Approved courses may be taken in other departments.

Dissertation Requirement

A student may start his dissertation during his first year of doctoral work. A dissertation committee will be appointed by the chairman of the department upon the recommendation of the departmental graduate committee. The dissertation committee will be responsible for initial approval of the dissertation in its final form.

Language Requirement

There is no general language requirement, although advisers may recommend preparation of a foreign language by individual students, depending on their specialty areas.

Teaching Requirement

Some teaching experience is required. This requirement may be satisfied by at least one year of service as a teaching assistant or by suitable teaching duties.

Final Oral Examination

The final oral examination is taken after completion of all other requirements for the degree. This examination will not be held until at least two weeks after the dissertation has been accepted by the departmental graduate committee and must be passed at least two weeks before the commencement at which the degree is to be awarded.

The final oral examination will deal with the subject matter of the doctoral dissertation, significant developments in the field of the dissertation, and subject matter as required by the examining committee.

Program

The program will normally be taken in accordance with the following pattern:

FIRST YEAR					
Fall		Credits	Winter		Credit
19.808	Quantitative Methods I	3	19.809	Quantitative Methods II	3
19.817	General Experimental Psychology I ...	4	19.818	General Experimental Psychology II ...	4
19.980	Research Methods I	2	19.981	Research Methods II	2
		<u>9</u>			<u>9</u>
Spring					
				Credits	
19.810	Quantitative Methods III	3			
19.819	General Experimental Psychology III ..	4			
19.982	Research Methods III	2			
		<u>9</u>			

SECOND YEAR

Six quarter hours of research and at least 9 quarter hours of electives must be taken during the second year.

All course work beyond the first year is elective and is determined by the student and his adviser with the approval of the graduate committee.

DESCRIPTION OF COURSES

All courses carry three quarter hours of credit unless otherwise specified.

19.807 Mathematical Psychology

Several theories which generate quantitative predictions of behavior are presented.

19.808, 19.809, 19.810 Quantitative Methods I, II, III

A survey of the quantitative methods used in experimental psychology, emphasizing applications of computer programming, theory of functions and relations, curve fitting, probability functions, set theory, and analysis of variance.

19.814 Information-Processing Models in Psychology

Sensory systems considered as information-flow channels, with emphasis on the visual system. Topics to be discussed include: Selection and encoding of sensory information, the effects of neural inhibition and feedback, and application of linear systems analysis to sensory systems.

9.815 Signal Detection Theory Seminar

This seminar is directed towards the general theory of signal detectability and its application to psychophysical experiments. First, the seminar will consider the general theory of signal detectability at its current state of development. Then, it will consider appropriate procedures for data collection and analysis in order to fit them into the signal detection context.

9.817, 19.818, 19.819 General Experimental Psychology I, II, III (4 q.h.)

The Departmental proseminar. Student presentations and discussions of the experimental literature relating to faculty research interest areas. Includes units in scientific method, learning, sensory processes, physiological variables, personality and developmental variables, and applications of basic research.

9.828, 19.829 Modern Psychophysics I, II

Evaluation and practice of scaling procedures developed by Stevens, and consideration of neuro-physiological evidence supporting the power law.

9.833 Perception

Detailed consideration of research in such areas as form, space and pattern perception, recognition, and the effects of set and motivation on perception. Physiological concomitants of perceptual phenomena will be considered.

9.835, 19.836, 19.837 Learning and Behavioral Analysis I, II, III

These seminars cover contemporary research in operant conditioning, with emphasis on relating the techniques of behavioral analysis to problems of reinforcement, comparative psychophysics, and physiological psychology.

9.838 Human Learning and Cognition

Critical evaluation of current problems in human learning, including concept learning, directed thinking, attention, memory, probability learning, serial and paired-associate learning.

9.844, 19.845, 19.846 Physiological and Comparative Psychology I, II, III

Seminars: a shared background, key concepts, and central issues of the field of physiological and comparative psychology.

9.860, 19.861, 19.862 Vision I, II, III

Seminars: classical and modern problems in vision. Recent journal articles will provide primary source materials for discussion. Consideration will be given to problems of stimulus specification, retinal structure, photochemistry, and psychophysical measures of sensitivity, color vision, and electrophysiology.

9.880, 19.881 Sensory Psychophysiology I, II

Concentration on the anatomy and physiology of the various sensory systems, and correlation of these data with psychophysical and perceptual concepts. Laboratory work will be included.

9.901, 19.902, 19.903 Personality Theory and Research I, II, III

A survey of representative theoretical formulations of the normal personality and its development, and an examination of experimental evidence bearing upon relevant concepts and assumptions (e.g. anxiety, repression, aggression, cognitive styles).

19.808, 19.809, 19.810 Quantitative Methods I, II, III

A survey of the quantitative methods used in experimental psychology, emphasizing applications of computer programming, theory of functions and relations curve fitting, probability functions, set theory and analysis of variance.

19.912, 19.913, 19.914 Behavior Modification I, II, III

Survey and demonstrations of applied behavior analysis, with emphasis on behavior therapies, retardate training techniques, and classroom behavior modification.

19.980, 19.981, 19.982 Research Methods I, II, III (2 q.h.)

Instrumentation and laboratory techniques through instruction and participation in ongoing laboratory projects.

19.990 Special Topics in Psychology (maximum: 9 q.h.)

19.991 Thesis (6 q.h.)

Experimental work for the master's degree requirement.

19.995 Dissertation

Experimental and theoretical work for Ph.D. candidates.

sociology and anthropology

Professors

Norman Kaplan, Ph.D.,
Chairman
Morris Freilich, Ph.D.
Blanche Geer, Ph.D.
Frank F. Lee, Ph.D.
Morton Rubin, Ph.D.
Earl Rubington, Ph.D.

Associate Professors

M. Catherine Bateson, Ph.D.
Patricia Golden, Ph.D.
Elliott A. Krause, Ph.D.
Lila Leibowitz, Ph.D.
Jack Levin, Ph.D.
Assistant Professors
Marcia Garrett, Ph.D.
Wilfred Holton, Ph.D.
Carol A. Owen, Ph.D.
Alex Rysman, Ph.D.

Immission

The general procedures and requirements are set forth on page 20. Students will normally be admitted to begin their graduate work in the Fall Quarter only. Applications received after March 15 will usually not be considered. Each application will be reviewed on its own merits. Any questions concerning the adequacy of the undergraduate background in sociology or anthropology will be considered individually. In some cases, students may be asked to make up certain deficiencies before proceeding to the basic requirements. Exceptions will be made with respect to procedural or substantive requirements on an individual basis if the circumstances seem sufficiently compelling.

In addition to examining the catalog and course offerings, all prospective candidates are urged to learn something about the scholarly interests and writings of our faculty and to talk with graduate students now in residence to ascertain whether or not we have something to offer in terms of their capabilities, needs, and interests.

B. Some of the requirements listed below for both the M.A. and Ph.D. will undoubtedly have been modified. Please check with the department and/or the graduate school for the most recent information. This applies also to course offerings.

THE MASTER'S DEGREE

The department offers graduate programs that lead to a master of arts degree in sociology or social anthropology. Forty-two quarter hours of B or better academic work are required for the degree. Certain advanced undergraduate courses offered by the department may be taken for graduate credit with the approval of the department. Students must maintain a better than B average.

In general, students are encouraged to fashion a program of studies best suited to their needs and capabilities instead of following a single set of rigid requirements. To this end, all entering student should consult with members of the faculty and make a tentative choice of faculty adviser before registering for courses.

For the Master of Arts in Sociology, students are generally required to take three quarter courses in theory (usually 21.805, 21.806, and 21.807) and two in methodology (usually 21.810 and 21.811). The statistics requirement may be satisfied by achieving at least a B in 21.814 or its equivalent. All students are strongly advised to take some work in social anthropology.

For the Master of Arts in Social Anthropology, students are generally required to take two quarter courses each in theory (usually 20.80 and 20.802) and methodology. Other requirements will be individually determined. All students are strongly advised to take some work in sociology.

Students who can demonstrate proficiency in any of the requirements need not take those particular courses.

A master's paper is required and earns four quarter hours of credit. This paper may be based on empirical or library research, and must be of publishable quality. It is expected that the full-time student will complete his master's paper no later than the end of his second year. Students planning to go on for the Ph.D. are urged to take the qualifying examination during their second year of residence as the result will be a major determining factor in deciding whether to encourage the student to try to go on or not.

Deadlines for Submission of Master's Paper

A student must have substantially finished his master's paper and certified by his first reader on or before April 1 of the year in which he expects to be awarded the degree. Those who miss the April 1st deadline will normally have to wait until the subsequent fall quarter, and should not expect that a defense can be set up much before November 1st of that quarter.

THE DOCTOR OF PHILOSOPHY DEGREE

The department offers the Ph.D. in sociology. A limited number of students will be enrolled in the Ph.D. program so as to provide highly personalized study and research training with individual supervision.

Admission

Applicants to the doctoral program should apply for admission no later than March fifteenth of the year in which they expect to complete the requirements for the master's degree.

Students seeking admission whose master's degree is not in sociology will be considered on an individual basis. A tentative evaluation of the probability of advanced standing will be made at the time the student is admitted with the final determination after the qualifying examination has been completed.

Students completing their master's at Northeastern will be considered for admission to the doctoral program only after the results of their qualifying examination have been evaluated. Students completing their master's at another institution are admitted with the expectation that they will take the qualifying examination at the first available opportunity.

residence Requirement

The university's residence requirement can be satisfied by one year of full-time graduate work, or its equivalent, beyond the Master of Arts degree. If the M.A. has not been in sociology, a longer period of residence will undoubtedly be essential. Most students should expect to spend approximately two years or the equivalent in full-time graduate study beyond the requirements of the master's degree.

Degree Candidacy

Degree candidacy is established in accordance with the general regulations of the graduate school.

Qualifying Examination

Students will be examined on their basic knowledge of sociology, especially theory and research methods. The main purpose of this test is diagnostic and should help both the department and the student evaluate strengths and weaknesses and chart a course for the future in the light of these results. Excessive weaknesses and lack of sufficient depth will lead to a recommendation to consider pursuing other alternatives elsewhere.

Students completing their master's work at Northeastern must take the qualifying examination before being admitted to the doctoral program. Students entering the program with a master's degree from another institution should take the qualifying examination at the earliest opportunity after enrolling at Northeastern University.

Course Requirements

Generally, forty-two hours of academic work beyond the master's degree are required. However, the actual number needed by any particular student will be specially determined in each case. Depending on background, experience, and performance, a greater or lesser number of formal courses may be required. Decisions on special cases will be made by the Committee on Graduate Studies (COGS), acting in conjunction with the student, his adviser, and the chairman of the

department. Students entering from another university may be required to take certain basic courses before proceeding with the doctoral program.

Language Requirements

A reading knowledge of French and German is required. Petitions to substitute any other language in which there is substantial sociological literature will be considered. Petition for such substitutions must be submitted for approval to COGS. The language requirements must be satisfied before admission to the comprehensive examination. Statistics and/or advanced mathematics as well as languages needed primarily for field research are considered an integral part of the training of students specializing in such directions, and are therefore not the equivalent of the general language requirement.

Comprehensive Examination

During the period of doctoral degree candidacy, each student must pass a comprehensive examination. This will cover sociology (including theory and methods) and social anthropology. The comprehensive examination must be passed at least nine months before the commencement at which the Ph.D. is to be awarded.

Doctoral Dissertation

The student must submit a prospectus describing the topic of his doctoral dissertation, his methods of research, and the theoretical relevance of his problem. This prospectus is to be discussed with and approved by the dissertation committee consisting of the major advisor, two readers within the department and at least one reader from outside the department. The revised prospectus is then filed with the department.

Deadlines for Considering a Doctoral Dissertation

The chairman of the dissertation committee should be fully satisfied that a dissertation is substantially complete on or before April 1 of the year in which the candidate expects to defend.

Final Oral Examination

The dissertation will be defended after completion of all other requirements for the doctoral degree. This oral defense will be held approximately four weeks after the dissertation has been accepted by the dissertation committee, and at least two weeks before the commencement at which the degree is to be awarded.

NB. Some of the requirements listed above for both the M.A. and Ph.D. will undoubtedly have been modified. Please check with the department and/or the graduate school for the most recent information. This applies also to course offerings.

DESCRIPTION OF COURSES

All courses carry three quarter hours of credit unless otherwise specified.

SOCIAL ANTHROPOLOGY

any undergraduate courses in the 20.200 series may be offered for graduate credit. Students should check the current course announcements to take advantage of these offerings.

.801, 20.802 Theory I, II

story of major contemporary orientations: evolutionary approaches, culture area, cultural ecology, functionalism, structuralism, and analysis of current status of these and related theories.

.805, 20.806 Field Work I, II

Data collection through participant observation and related anthropological methods. Data analysis and reports.

.815 Tribal Societies and Culture

Structures and institutions of bands, tribes, and chiefdoms: comparative and functional studies of tribal societies and the dynamics of change under contact situations.

.820 Peasant Society and Culture

Institutions of peasant society. The structure of traditional civilizations and the interrelations between urban and local communities: comparative and functional analysis of the peasant community and the dynamics of change from peasant to post-peasant and industrialized societies.

.825 Language and Communication

Human communication, including language. Theories of the evolution of language and the application of models derived from the study of language to other aspects of behavior.

.830 Individual and Culture

Examination of current theory and method in the study of the interplay between personality and culture. Contributions by various disciplines are discussed.

.835 Kinship and Social Structure

Variety of kinship systems and their terminological and structural components and the way in which their systems articulate with other social institutions.

.836 Family in Evolutionary Perspective

The emergence of family from pre-human patterns, its biological and behavioral components, and its cross-cultural variations examined from an evolutionary perspective.

.840 Urban Anthropology

Selected problems in anthropological studies in urban societies.

20.850 Religion and Myth

Nature and institutionalization of primitive, ancient, and contemporary religions
Exploration of religious concepts and movements in relation to social, religious
and political organization.

20.860 Cultural Ecology

Examines man's adaptation to environment and the effect of different human
adaptations on natural systems.

20.870 Evolution of Society

The development of political and economic institutions: specialization, social
stratification and the emergence of civilization.

20.880, 20.881, 20.882, 20.883, 20.884, 20.885

Ethnographic area courses (India, Africa, Mediterranean and others) will be
offered as resources permit.

20.950, 20.951, 20.952 Directed Study in Social Anthropology (maximum: 9 q.h.)

Reading and empirical research in social and cultural anthropology supervised

by members of the anthropological staff.

20.980 Contemporary Issues in Social Anthropology

Contemporary issues in the field of anthropology. Supervised readings and
written reports on special problems.

20.990 Seminar (maximum: 9 q.h.)

Discussion of selected topics in the field of anthropology.

20.991 Master's Paper in Social Anthropology

Empirical or library research meeting the criteria for publication in a profes-
sional journal. *Supervision by members of the department.*

SOCIOLOGY**21.189 Essentials of Statistical Theory**

This course reviews concepts essential to an understanding of statistical theory
relevant for sociologists. It will include a review of measures of central tendency
and dispersion, elementary probability theory, standard probability distribution
(Normal, Chi-square, F distribution, student's T distributions, binomial, Poisson
etc.), sampling theory, sampling distribution, and the theory of hypothesis testing.
*It may be used to remedy deficiencies in prior statistical training but it does
not carry graduate credit.*

21.805, 21.806 Foundations of Social Theory I and II

The classic theorists (Durkheim, Weber, Marx, Simme, and others) will be
considered intensively.

21.807 Contemporary Sociological Theories

Analytic treatment of major contemporary theories such as functionalism, con-
flict, neo-Marxism, and others. *Prep. 21.806.*

21.808 Recent Developments in Sociological Theory

New horizons in theory and the relation of theory to research. Topics to be
selected each year and announced by the instructor. *Prep. 21.807.*

I.810 Introduction to Research Methods I

Methods of empirical social research including survey techniques, interviewing, questionnaire construction, sampling procedures, experimental design, and content analysis.

.811 Introduction to Research Methods II

continuation of work begun in 21.810. Students will conduct individual research projects.

.812 Current Issues in Social Research

Selected topics will be examined.

.813 Statistical Methods for Sociologists

This course is a detailed introduction to statistical methods most relevant to sociology. Topics include tabular analysis, non-parametric statistics, analysis of variance, regression analysis, path analysis, measures of association, estimation and univariate and multivariate hypothesis testing. The approach will assume a knowledge of elementary statistical theory—especially of sampling distribution and the effects of sampling procedure and samples size on their characteristics. Laboratory work including computer processing will be required.

.814 Mathematical Models and Advanced Statistical Methods for Sociologists

This course will include selected topics in advanced sociological statistics: introduction to Markov chains, factor analysis, multiple classification analysis, and model building. The orientation will be toward the more advanced students and the approach will be somewhat mathematical. Some mathematical aptitude or at least one previous college course in mathematics is suggested. Graduate statistics (21.813) is a prerequisite.

.817 American Society

Study of the development of and the changes in the institutional structure of American society in comparison with certain other social systems.

.820 Sociology of Deviant Behavior

Applications of sociological concepts and principles to some problems of social organization in industrial societies. Analysis of such problems as suicide, prostitution, physical handicaps, unemployment, alcoholism, sexual deviance, and gambling. *Prep. 21.806.*

.827 Sociology of Delinquency

Social and psychological factors of delinquency and their implications for prevention, rehabilitation, and treatment.

.830 Penology and Corrections

Police, court, corrections. The penal system and its treatment methods. Prison, capital punishment. Probation and conditional sentencing. The inmate society. Parole. After-care. Social consequences of crime.

.835 Theories of Criminology

Theories and philosophies, underlying various correctional systems. Schools of thought in criminology and penology. Theoretical approaches to the crime and delinquency problem from the beginnings of criminology to current thinking.

21.837 Sociology of Law

Fundamentals of law. The concept of social control. Order and Law. Consensus and conflict. Analysis of the normative-formative influences of law. Mores and morals. The concept of justice. Analysis of some legal institutions.

21.840 Sociology of Medicine

Social aspects of illness and medicine, historically and cross-culturally. Illness and the medical profession in modern society and their structural settings: the community, the hospital, the medical school. Research studies in the field will be examined critically and problems for future research will be specified.

21.843 Sociology of Education

The structure and functioning of educational institutions. Student, faculty, and administrative perspectives. Emphasis will be placed on the role of education in processes of socialization, social mobility, social change, and social control.

21.847 Formal Organizations

Analysis of the goals, functions, and consequences for the individual in modern organizations. Aspects of bureaucratization will be examined within business firms, public institutions, and private associations.

21.850 Sociology of Occupations and Professions

The relations between the occupations and professions and society. Special topics may include occupational stratification, professional group behavior, recruitment and socialization of occupations and professions, and political activism.

21.855 Political Sociology

Sociological analysis of power relations and power systems with special attention to the bases of political power, processes of change in power, and the part played by violence and revolutionary movements.

21.857 Economic Sociology

The role of economic factors in the social process. Consideration will be given to both classic economic theory and its impact on classic social theory, and the potential interrelations between modern economic theory (especially mode building approaches) and general sociological problems.

21.860 Intergroup Relations

The relations between various racial, nationality, cultural, and religious groups with emphasis on historical development. Particular attention will be paid to American society with its specific problems of adjustment and assimilation.

21.863 Sociology of Religion

A sociological analysis of religious institutions and experiences in their historical and contemporary content. Religion and political content will be considered.

21.865 Sociology of Knowledge

The relationship between the social base of a society and its intellectual products. The viewpoints of authors such as Marx, Weber, Mannheim, G. T. Mead, the Neo-Marxian, and other modern schools will be considered. *Prerequisite: Three terms of graduate theory.*

870 The Family

cial structure and social functions of the family as a social institution. Relations between the family and other institutions in society will be examined comparatively and historically.

873, 21.874 Childhood and Adolescence I, II

rowth and development of the child in the social context. Primary socialization of the family including the transmission of role expectations, values, and the development of self concept. Secondary group socialization in school, neighborhood, and peer group.

877 Theories of Socialization

critical examination of the major theories in the field. Attention will be focused on the work of Freud, Piaget, Cooley, Mead, Parsons, and Merton.

880 Community Analysis

ological theories of man's relation to his physical environment. Development of the concept, and discussion of methods for community study. Comparison between rural communities and urban neighborhoods. Discussion and evaluation of community action programs.

881 Community Research Lab.**885 Urban Sociology**

ories of the development of urban life. Comparisons between pre-industrial and industrializing urban areas. Methods for the study of urban social structure and change. Evaluation of contemporary metropolitan action programs.

886 Seminar in Urban Social Research Policies

ocial science theories and methods are evaluated from the perspectives of urban affairs research. *Consent of instructor.*

890 Middle East Area Study

cio-cultural analysis of the Middle East. Ecological, structural, institutional, and normative factors in nomadic, rural, and urban life. Comparative regional analysis.

895 Latin American Societies

udy and analysis of selected Latin American societies with particular attention to such countries as Cuba, Mexico, Peru, and Brazil. Emphasis on urbanization and industrialization, social and political change.

900 Issues in Social Psychology

uman behavior and theories of self from a sociological and psychological perspective. Special consideration of interpersonal relations, socialization, and symbolic interaction.

910 The Sociology of Science

Selected topics dealing with interactions between science and society. *Consent of instructor.*

.912, 21.913 Experimental Methods in Social Research I, II

is course covers experimental design and laboratory methods in sociology. A small groups laboratory is treated as a setting for testing sociological theory.

The emphasis is upon techniques and problems in the creation and manipulation of social variables in the laboratory situation, although the techniques of natural experiment are also considered.

21.915 Seminar in Symbolic Interaction

The social psychology of groups as found in the works of Mead, Becker, Blum, Goffman, and others.

21.916, 21.917 Seminar in Qualitative Analysis I, II

First Quarter: Social Structure process and meaning in interacting groups. Each student studies a face-to-face group by means of participant observation using symbolic interaction concepts. **Second Quarter:** Situational analysis of field data. The relation of method and theory.

21.920 Social Stratification

Theories of inequality between groups in historical perspective, from classic to modern industrial times. Discussion and evaluation of sociological research in social stratification in regard to different social and cultural groups.

21.930, 20.930 Social and Cultural Change S, A

Two-quarter course, in conjunction with Anthropology.

Analysis of the changing patterns in social, economic, and political institutions. Modern social trends are discussed.

21.940, 21.941 Social Control I, II

Seminar in research, theories, and methods in the sociology of social control.

21.950, 21.951 Seminar in Social Structure I, II

Seminar relating current theories and research in sociology, social psychology, and social anthropology.

21.960, 21.961, 21.962 Seminar on Socialization I, II, III

I. Instructor reviews theories and findings in organizational socialization. Students design studies in organizational socialization. III. Students present results of their studies. *Not open to first year students.*

21.980 Contemporary Issues in Sociology

Contemporary issues in sociology. Supervised readings and written reports on special problems.

21.990 Seminar (maximum: 9 q.h.)

Discussion of selected topics in the field of sociology.

21.991 Master's Paper in Sociology

Supervision by members of the department. Empirical or library research meeting the criteria for publication in a professional journal.

21.992, 21.993, 21.994 Directed Study in Sociology (Maximum: 9 q.h.)

Reading and research under the direction of a faculty member. *Open to doctoral candidates with the consent of the graduate committee.*

21.995 Doctoral Dissertation

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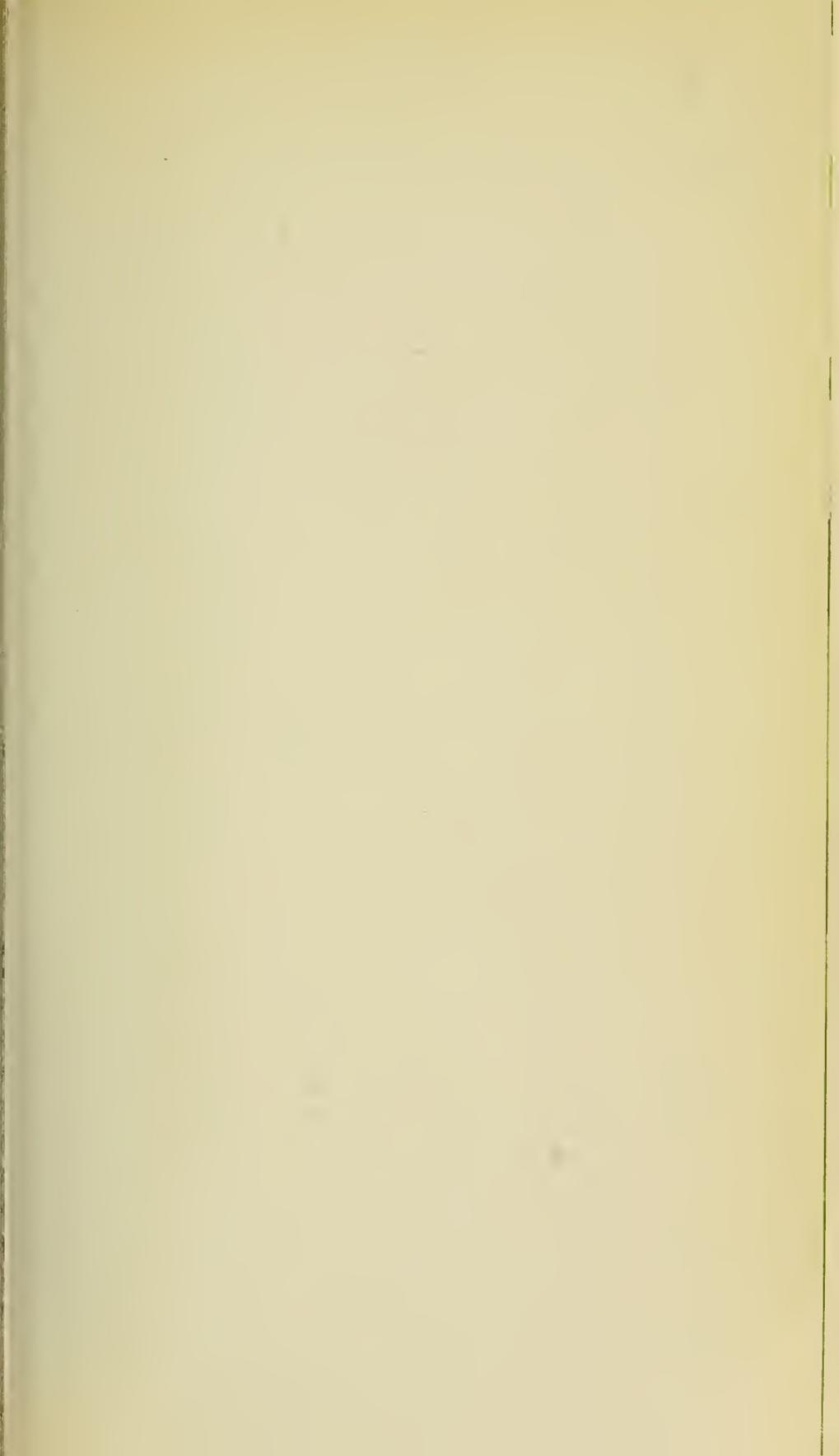
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DEPARTMENTAL DIRECTORY

Department	Room	Telep Num
Biology	403 RI	437-1
Chemistry	102 HT	437-1
Economics	301 UR	437-1
English	170 UR	437-1
History	358 RI	437-1
Mathematics	504 UR	437-1
Physics	109 DA	437-1
Political Science	340 KV	437-1
Psychology	440 UR	437-1
Sociology/Anthropology	580 UR	437-1





northeastern university bulletin

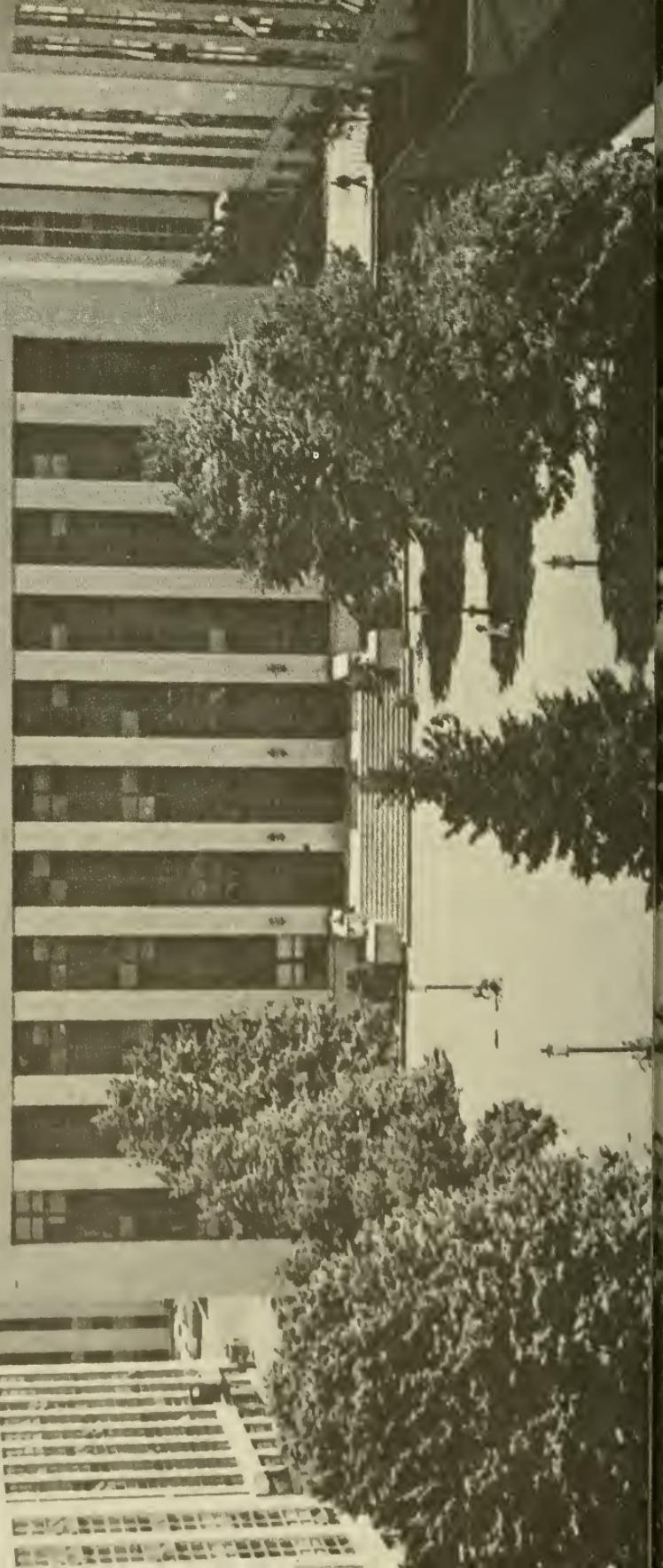


northeastern university bulletin



Northeastern University
100 Dockser Hall
Boston, Massachusetts 02115
Telephone (617) 437-3154

NORTHEASTERN UNIVERSITY

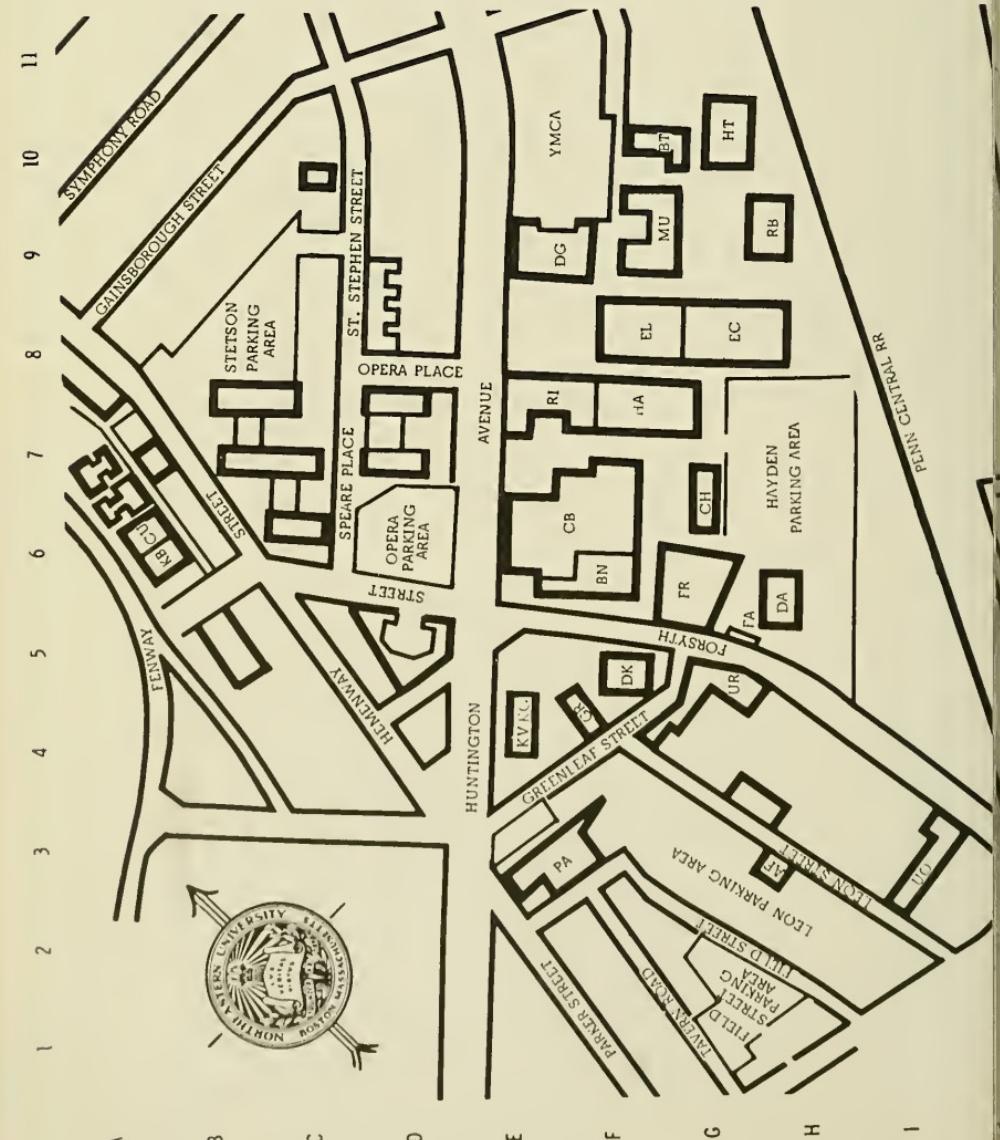


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<u>Building Designation</u>	<u>Building</u>
BN	Bartlett Natatorium
BT	Botolph Building
CB	Cabot Physical Education Ctr.
CH	Churchill Hall
CU	Cushing Hall
DA	Dana Research Center
DK	Dockser Hall
DG	Dodge Library
EC	Elli Student Center and Alumni Auditorium
EL	Forsyth Building Annex
FR	Greenleaf Building
FA	Hayden Hall
GR	Hurtig Hall
HA	Kennedy Building
HT	Knowles Center (Volpe), Knowles Center (Gryzmish)
HJ	11 Leon Street
KB	Astro-American Institute
MU	Mugar Life Sciences Building
PB	Parker Building
PA	Richards Hall
RI	Robinson Hall
RB	United Realty Building
UR	

MAP REFERENCE



ACADEMIC CALENDAR 1974-75

Fall Quarter 1974

Registration period

Burlington	Wednesday-Thursday	Sept. 18-19
Boston	Monday-Thursday	Sept. 23-26

Interview period for new students by

appointment*	Wednesday-Thursday	Sept. 23-26
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Classes begin

Monday September 30

Winter Quarter 1974-75

Registration period

Burlington	Tuesday	December 3
Boston	Monday-Thursday	Dec. 9-12

Interview period for new students by

appointment*	Monday-Thursday	Dec. 9-12
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Classes begin

Monday January 6

Spring Quarter 1975

Registration period

Burlington	Tuesday	March 11
Boston	Monday-Thursday	Mar. 17-20

Classes begin

Monday April 7

Last day to file commencement card

for spring commencement	Tuesday	April 1
-------------------------	---------	---------

Last day to pay fee for

spring commencement	Wednesday	April 30
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Final grades due in Registrar's

Office for June graduates taking third quarter course	Friday	June 6
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Spring commencement

Sunday June 22

Summer Quarter 1975

Registration period

Burlington	Monday-Tuesday	June 16-17
Boston	Wednesday-Thursday	June 18-19

Classes begin

Monday June 30

Duration of summer quarter

Monday-Friday June 30-Aug. 8

Last day to file commencement

card for fall commencement	Tuesday	July 1
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Last day to pay fee for

fall commencement	Friday	August 1
-------------------	--------	----------

Fall commencement

Thursday September 11

*Appointments for interviews with new students must be made at least four days before the date of the interview.

UNIVERSITY HOLIDAYS 1974-75

Columbus Day	Monday	October 14
Veterans' Day	Monday	October 28
Thanksgiving Recess	Thursday-Saturday	Nov. 28-30
Christmas Vacation	Monday-Tuesday	Dec. 23-Jan. 4
Washington's Birthday	Monday	February 17
Patriots' Day	Monday	April 21
Memorial Day	Monday	May 26
Independence Day	Friday	July 4
Labor Day	Monday	September 1

Equal Opportunity Policy

Northeastern University is committed to a policy of providing equal opportunity for all. In all matters involving admission, registration, and all official relationships with students, including evaluation of academic performance, the University insists on a policy of nondiscrimination. Northeastern University is also an equal opportunity employer; it is institutional policy that there shall not be any discrimination against any employee or applicant for employment because of race, color, religion, sex, age or national origin. In addition, Northeastern takes affirmative action in the recruitment of students and employees.

the governing boards and officers of the university

THE CORPORATION

Julius Abrams	Mrs. Anthony S. Camarota
Charles F. Adams	(Dorothy Dodge)
Vernon R. Alden	Erwin D. Canham
William T. Alexander	*Richard P. Chapman
O. Kelley Anderson	Theodore Chase
Diana J. Auger	Robert F. Chick
Allen G. Barry	Vessarios G. Chigas
Lincoln C. Bateson	Carl W. Christiansen
Thomas P. Beal	*David H. Cogan
Roy H. Beaton	Abram T. Collier
F. Gregg Bemis	William A. Coolidge
Beverly Ann Bendekgey	Edward Creiger
Edward L. Bigelow	H. James Crossan, Jr.
Robert D. Black	*Robert Cutler
Gerald W. Blakeley, Jr.	Marshall B. Dalton
Raymond H. Blanchard	Roger C. Damon
S. Whitney Bradley	*Edward Dana
Rexford A. Bristol	William O. DiPietro
Edward W. Brooke	Alfred di Scipio
George R. Brown	Estelle Dockser (Mrs.)
Martin Brown	*William R. Driver, Jr.
William L. Brown	*Carl S. Ell
William H. Bruce, Jr.	*Byron K. Elliott
John L. Burns	*William P. Ellison
Hyman H. Burstein	Joseph A. Erickson
Victor C. Bynoe	Robert Erickson
Louis W. Cabot	*Frank L. Farwell
Norman L. Cahners	James V. Fetherero
Charles W. Call, Jr.	Eldred L. Field
Henry F. Callahan	Joseph F. Ford

Member of the Board of Trustees
Robert Cutler, deceased May 8, 1974

Thomas J. Galligan, Jr.
William W. Garth, Jr.
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the university

Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under the General Laws of Massachusetts. The State Legislature by special enactment has given the University general degree-granting powers. The University is governed by a Board of Trustees elected by and from the Northeastern University Corporation, which is composed of nearly 180 distinguished business and professional men and women.

From its beginning, Northeastern University has had as its dominant purpose the discovery of community educational needs and the meeting of these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Cooperative Plan, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922), Liberal Arts (1935), Education (1953), Pharmacy (1962), Nursing (1964); Boston-Bouvé College (1964); the College of Criminal Justice (1967); and by Lincoln College's daytime Bachelor of Engineering Technology program (1971). This educational method enables students to gain valuable practical experience as an integral part of their college program and also provides the means by which they may contribute substantially to the financing of their education. The Plan has been extended to the graduate level in engineering, actuarial science, rehabilitation administration, professional accounting, business administration, and law.

In the field of adult education, programs of study have been developed to meet a variety of needs. University College offers evening courses — offered by the University since 1906 — and adult-day courses leading to the bachelor's degree. In addition to offering day undergraduate programs in Electrical Engineering Technology and Mechanical Engineering Technology, Lincoln College offers evening/part-time certificate, associate, and bachelor degree programs in technological areas. All formal courses of study leading to degrees through part-time programs are approved by the Basic College faculties concerned.

GRADUATE AND PROFESSIONAL SCHOOLS

The 10 graduate and professional schools of the University offer day and evening programs leading to the degrees listed.

The Graduate School of Actuarial Science offers the degree of Master of Science in Actuarial Science.

The Graduate School of Arts and Sciences offers the degrees of Master of Arts, Master of Science, Master of Science in Health Science, Master of Public Administration, and Doctor of Philosophy.

The Graduate School of Boston-Bouvé College offers the degree of Master of Science, with specialization in Physical Education and Recreation Education.

The Graduate School of Business Administration offers the degree of Master of Business Administration.

The Graduate Program in Criminal Justice offers the degree of Master of Science.

The Graduate School of Education offers the degree of Master of Education and the Certificate of Advanced Graduate Study.

The Graduate School of Engineering offers the degrees of Master of Science, Engineer degree, Doctor of Engineering, and Doctor of Philosophy.

The School of Law offers the degree of Juris Doctor.

The Graduate School of Pharmacy and Allied Health Professions offers the degrees of Master of Science and Doctor of Philosophy.

The Graduate School of Professional Accounting offers the degree of Master of Science in Accounting.

CENTER FOR CONTINUING EDUCATION

The Center for Continuing Education was established in 1960 to relate the University to the needs of its community in a period of accelerated change. Adult education programs offered by the Center and University College have since been consolidated. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. The Division of Special Programs, working cooperatively with trade associations and professional societies, offers a wide variety of programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

RESEARCH ACTIVITIES

The facilities of the University are engaged in a wide variety of basic research projects in business, science, social science, pharmacy, and engineering. These are coordinated by the Dean of Research, whose services are University-wide and available to the faculties of all the Colleges.

Although Northeastern is primarily concerned with undergraduate and graduate instruction, the University believes that the most effective teaching and learning take place in an environment characterized by research activities directed toward extending the frontiers of knowledge.

buildings and facilities

MAIN CAMPUS

The main campus of Northeastern University is located at 360 Huntington Avenue in the Back Bay section of Boston. Many of the city's famous cultural, educational, and philanthropic institutions are situated in the Back Bay, including the Museum of Fine Arts, Symphony Hall, Horticultural Hall, the Isabella Stewart Gardner Museum, the Harvard teaching hospitals, the Boston Public Library, and many schools and colleges. Most are within walking distance of Northeastern University. Major transportation facilities serving the Boston area are Logan International Airport, two rail terminals, bus terminals serving inter- and intrastate lines, and MBTA subway-bus service within the metropolitan-suburban area. There is a subway stop in front of the campus. For motorists, the best routes to the campus are the Massachusetts Turnpike (exit 22) and Route 9, of which Huntington Avenue is the intown section. The campus of 48 acres is divided by Huntington Avenue, with the main educational buildings on one side and dormitories on the other. The principal buildings, all of which have been constructed since 1938, are of glazed brick in contemporary classic style. Most are interconnected by underground passageways.

| Student Center

The Carl S. Ell Student Center provides facilities for student recreation and for extracurricular activities. The Alumni Auditorium, with a seating capacity of 1,300, is part of the Center. Also included are special drama facilities, a ballroom, main lounge, fine arts exhibition area, student offices, conference rooms, and a dining area seating more than 300.

braries

The University library system consists of the Dodge Library, which is the main library; the Suburban Campus Library at Burlington; the School of Law Library; and divisional libraries for Physics and Electrical Engineering, Chemistry and Biology, Mathematics and Psychology, and Health, Physical and Recreation Education, and Physical Therapy. There are additional subject collections for the Center for Management Development at Andover, Massachusetts, and the Marine Science Institute in Nahant.

The library collections number 360,000 volumes supplemented by some 267,000 titles in microprint, microfilm, and microfiche forms. The collection includes, in addition, some 3,500 periodical titles, 90,000 documents, and 4,600 sound recordings.

Cabot Physical Education Center

The Godfrey Lowell Cabot Physical Education Center is one of the best equipped in New England. The large gymnasium contains four basketball courts. In addition, the Center consists of an athletic cage, a small gymnasium, and a rifle range, as well as administrative offices for the Department of Athletics and for the Physical Education Department of Boston-Bouvé College.

A recent addition to the center, the Barletta Natatorium, houses a 105-foot swimming pool, a practice tank for the crew, handball courts and shower and dressing facilities.

Dockser Hall

Charles and Estelle Dockser Hall, completed in 1968, houses a large gymnasium, dance studio, motor performance laboratory, college library, community recreation laboratory, folk arts center, dark and music rooms, recreation resources area, locker rooms, offices, classrooms, conference room and lounge, storage facilities, and a research laboratory.

Apartments for Graduate Students

The University maintains a 100-apartment housing unit which accommodates 279 people. Two-, three-, and four-party apartments are available which vary in size from two to four rooms plus bath. Apartments are furnished with beds, chairs, desks, stove, refrigerator, and kitchen table. The cost includes all utilities.

A \$50 deposit is required when making application for the apartments. Applications are available in the Office of University Housing. Students are expected to make such arrangements on a term-to-term basis but may live in the apartments both while on cooperative work assignments and in school if they wish. All reservations are made on a first come first served basis.

SUBURBAN FACILITIES

Suburban Campus

The Suburban Campus, located near the junction of Routes 128 and 3 in Burlington, Massachusetts, was established to meet the needs of individuals and of industry in the area.

In addition to graduate courses in engineering, physics, mathematics, business administration, science, education, and the arts, portions of undergraduate programs leading to the associate and bachelor's degrees, special programs for adults, and noncredit state-of-the-art programs are offered.

Warren Center

The Warren Center is a practical laboratory for Boston-Bouvé College in outdoor education and conservation, in group practicum, and in camping administration, programming, and counseling. At this Center in Ashland, completed in 1967, there are tennis courts, field hockey and lacrosse fields, waterfront for swimming and boating, overnight camp sites, fields and forests, heated cottages, the Hayden Lodge with a recreation hall, library, crafts shop, dining facilities, and conference accommodations.

Henderson House

The University's conference center, Henderson House, is located in Weston, Massachusetts. The Center for Continuing Education conducts short-term courses, seminars, and special institutes for business, professional, and research groups. Henderson House is 12 miles from the main campus.

Marine Science Institute

The Marine Science Institute at Nahant, Massachusetts, is a research and instructional facility primarily engaged in studies of marine biology and oceanography. The Institute is operated all year, and is about 20 miles northeast of Boston. Many of the courses at this institute are applicable toward an advanced degree in biology or health science.

Government Center Campus

With the cooperation of the Federal Executive Board, the Graduate School of Liberal Arts' Department of Political Science offers an entire Master of Public Administration program at the John F. Kennedy Building in downtown Boston. This program is primarily for individuals employed in Federal, state, or local civil services.

Brockton, Nashua, and Framingham Campuses

For students residing in southeastern Massachusetts and northeastern Rhode Island, the Graduate School of Business Administration offers a significant portion of its M.B.A. Program at facilities in Brockton, Massachusetts. These facilities, made available by the Knapp Corporation, are located on West Chestnut Street in Brockton.

Students residing in the southern New Hampshire area may take a significant portion of the M.B.A. Program at facilities in Nashua, New Hampshire. These facilities are furnished by Sanders Associates, Inc. and are located in their headquarters on Route 3, just over the Massachusetts line.

For students in the Framingham-Worcester area, a significant portion of the M.B.A. Program may be taken at classroom facilities located in Framingham, Massachusetts.

boston-bouvé college graduate school

The purposes of advanced study in Boston-Bouvé College are consistent with the philosophy of Northeastern University, and with the goals of advanced study in the professions. The programs are designed to fulfill the needs and interests of personnel in physical and recreation education in an era of social and educational change and redirection.

Graduate study is founded in the fields of knowledge and specialization which are extensively explored in upper-division or upper-class years of undergraduate preparation. The nature of advanced study leading to the master's degree demands of students and faculty attitudes of intensive critical analysis; cognitive development of idea and thought reliably tested in scholarly search and discussion, with application involving educational resources and practice; specialized research and creative experimentation in emerging theories, with application in the primary specialized field and its ancillary contexts; exploration and development of new trends in curriculum theory, process, and evaluation; critiques of professional reading and related literature; conversance with diverse methods and interpretation of scientific, philosophic, historical, and descriptive research; and a depth study using the appropriate research method in an approved investigation or thesis under faculty advisement.

The goals of graduate education in Boston-Bouvé College are:

1. To provide advanced preparation for administrators, supervisors, teachers, recreation specialists, coaches, and researchers through specific professional study and interdisciplinary experience.
2. To develop appreciation for the orderly approach to discovery through research, philosophical thought, and discussion.
3. To provide a sound basis for research and to facilitate student research experiences and applications.
4. To contribute to the development and refinement of dance, games, sports, recreation, and outdoor education within their cultural settings, and through comparative study.
5. To develop leaders and teachers capable of designing current and innovative approaches to learning and curriculum development.

6. To encourage intensive study in a specialized area of concern, with awareness of problems in education and society.
7. To provide a foundation for advanced study at the doctoral level.

PART-TIME STUDY

Graduate programs in Boston-Bouvé College are structured to provide an opportunity for the master's degree candidate to attend classes in the late afternoon or evening while continuing his/her full-time employment. By judicious use of electives and independent study, an unemployed student may carry the equivalent of a full-time course load.

Students normally take one or two courses per quarter and can complete the degree program in two to three years, depending upon whether or not course work is taken during the summer quarter.

Students maintaining a satisfactory academic standing may petition the Director of the Graduate School for permission to take more than two courses per quarter.

GENERAL REGULATIONS

The general regulations and minimum requirements for all graduate programs are established by the Northeastern University Graduate Council. In some matters the committee of each graduate school is allowed discretion to establish regulations within limits defined by the Council. The regulations and academic requirements which follow have been formulated in accordance with this general policy.

Application

All applicants should address inquiries to Boston-Bouvé College Graduate School. Application forms and information will be mailed promptly.

Registration

Students must register within the period listed on the school calendar. Registration will not be permitted after this period.

Residence

All work for advanced degrees must be completed in residence at the University, unless approval has been obtained from the Director of the Boston-Bouvé College Graduate School for work taken elsewhere. Students who are in residence and using the facilities of the University must register for such work.

Grading System

The performance of students in graduate courses is recorded by the instructor, using the following grades:

- A Excellent
For performance of high graduate caliber
- B Satisfactory
For performance at a satisfactory level
- C Fair
For performance not at the level expected in graduate work
- F Failure
For unsatisfactory performance

In addition, the following letter designations are used:

- I Incomplete
For failure to complete course work
- S Satisfactory without quality designation
For satisfactory completion of course work
- U Unsatisfactory without quality designation

The grades S and U are used for the first quarter of a two-quarter sequence in which the second-quarter grade applies to both the first and second quarters of the sequence: e.g., Thesis I and II.

The designation I is to be changed to a grade upon removal of the deficiencies which caused the I to be reported. Deficiencies must be removed within the quarter following that for which the I is received, unless an extension of time is granted by the instructor. However, such extension of time may not exceed two additional consecutive calendar quarters. Grades of Incomplete received in Thesis I and II may be continued beyond the two-quarter limit, but must be removed prior to graduation and within the six-year time limitation.

Any student who wishes to take a make-up examination must obtain permission from the Director of Boston-Bouvé College Graduate School by the second week of the quarter succeeding that in which the examination is missed. The make-up examination must be taken in that succeeding quarter unless circumstances warrant permission from the Director to defer it to the second succeeding quarter.

Class Hours and Credits

All credits at Northeastern University are entered as quarter-hour credits, with a quarter hour of credit being equivalent to three-fourths of a semester hour, i.e., 12 semester hours are equal to 16 quarter hours.

All classes in the Boston-Bouvé College Graduate School meet on a quarter basis, with an academic quarter defined as a term of approximately 12 weeks' duration. In the summer quarter, classes meet in a quarter of six weeks' duration. The academic calendar in the front of this

bulletin should be consulted to determine the opening dates of each quarter.

Continuity of Program

Students are expected to maintain continuous progress toward a degree. Any student who does not attend Northeastern for a period of one year must apply for readmission.

Withdrawals

In order to withdraw from a course, a student must fill out an official withdrawal form obtained at the Registrar's Office or at the Burlington Campus. Withdrawals may be made through the ninth class meeting of the quarter. Students will be withdrawn as of the date on which they complete the form. Ceasing to attend a class or notifying the instructor does not constitute an official withdrawal. Petitions for withdrawal from a course after the ninth class meeting of the quarter must be submitted to the Director of the Graduate School, and may be approved to avert unusual hardships on the student.

Students who do not attend the first two sessions will be dropped from the class unless they notify the Registrar of their intention not to withdraw.

Changes in Requirements

The continuing development of the Graduate School forces frequent revision of curricula. In every new bulletin, some improvements are indicated. When changes impose no hardship on the student and school facilities permit, the student is expected to meet the requirements of the latest bulletin. If the student finds it impossible to meet these requirements, the bulletin for the year in which he entered becomes the binding one.

Application for the Diploma

If a commencement card is not filed with the Registrar's Office on or before the applicable date listed on the calendar, there is no assurance that the degree will be granted in that particular year, even though all other requirements have been fulfilled.

THE MASTER OF SCIENCE DEGREE

Admission to Degree Candidacy

For admission to the Boston-Bouvé College Graduate School, a degree candidate must have presented the following to the Director of the Graduate School:

1. A completed application and \$15 application fee.
2. Official transcript(s) from accredited institution(s) as evidence of successful completion of the baccalaureate degree. The transcript(s) should show a cumulative average of 2.5 or better and a minimum of 18 semester hours or 24 quarter hours of work in the student's proposed major or related field.
3. Record of an interview with the Director of the Boston-Bouvé Graduate School or her designate. This requirement may be waived for out-of-state applicants.
4. Three references from persons familiar with the applicant's professional, academic, and character background.
5. An official record of the Miller Analogies Test score.

It is recommended that all materials be on file in the office of Boston-Bouvé College Graduate School at the time of the initial interview. In no case will a conference and course registration be permitted without a minimum of a completed application and a copy of the undergraduate transcript. The additional materials—the Miller Analogies Test score and references—must be received not later than the end of the sixth week of the first quarter.

Academic Classifications

Students whose materials meet the criteria listed above are classified as regular students.

Students whose materials do not qualify them for enrollment as regular students may be accepted as provisional students. Provisional students must obtain a B average in the first 12 quarter hours of credit at Northeastern University in order to continue the graduate program.

The Director of Boston-Bouvé College Graduate School may admit any person as a special student who presents evidence of a bachelor's degree and who appears otherwise prepared to undertake study in the Graduate School. Admission is on the provision that the applicant: a) files an application and b) acknowledges that should he subsequently wish to be reclassified as a degree candidate, only 12 quarter hours of academic credit earned as a special student may be applied toward a degree.

Academic Requirements

A candidate for the master's degree must complete an approved program conforming to requirements of the department in which he is registered. At the discretion of the Graduate Committee, any student whose record is not satisfactory may be dropped from the program. A minimum of 48 quarter hours of correlated, graduate-caliber work, along with other study required by the department, must be completed.

An average grade of at least B must be obtained in the quarter hours of credit required for the degree, excluding any transfer credits. Not more than eight quarter hours of extra or repeated courses are allowed to satisfy grade requirements for the degree.

Within the above limitations, a required course for which a grade of F is received must be repeated with a grade of C or better, and may be repeated only once. If a grade of F is received in an elective course, that course may be repeated once to obtain a grade of C or better, or another elective course may be substituted. If a grade of C is received in a required course, that course may be repeated once to obtain a grade of B or better.

A degree candidate's record is subject to review by the Boston-Bouvé College Graduate Committee upon completion of his sixth course at Northeastern University. At this time, he must have made reasonable progress in achieving his program objectives, and have obtained at least a B average. If the requirements are met, he is encouraged to continue the program. In the event his record is unsatisfactory, he may be dropped as a degree candidate from the Boston-Bouvé College Graduate School.

Program Selection

Upon acceptance as a degree candidate, the student is assigned to a program adviser in his major area of concentration. In consultation with his adviser, the student develops a program of study, including program objectives, anticipated courses, and estimated dates for completion of the various degree requirements. Prior to completion of the first 12 quarter hours of credit, the program requires approval by the Boston-Bouvé College Graduate Committee. Any subsequent changes in program require further Committee approval.

Transfer Credits

A maximum of 12 quarter hours of credit obtained at another institution is accepted toward the master's degree, provided that the credits are recommended for transfer by the student's program adviser; consist of work taken at the graduate level for graduate credit; carry grades of A or B; have been earned at a recognized institution; and have not been used toward any other degree. Students should petition the Director of the Graduate School in writing for all transfer credit, completing the necessary form obtainable from either the office of Boston-Bouvé College or the faculty program adviser. This form should be submitted to the student's program adviser along with an official transcript and a course description. Grades on transfer credits may not be used in obtaining the academic average necessary for completion of degree requirements.

Time Limitations

Course credits earned in the graduate study program or accepted by transfer are valid for a maximum of six years from the date of course completion unless an extension is granted by the College Graduate Committee.

Comprehensive Examination

A comprehensive subject-matter examination is taken by each candidate no later than two weeks before his commencement. This examination may be taken when the candidate has completed at last three-fourths of the designated course work, and received consent of his program adviser. The comprehensive examination is prepared by selected graduate faculty with whom the student has studied. The areas to be tested are commensurate with the student's specialization, area of concentration, and core subject matter appropriate to his professional field. The program adviser makes arrangements for the preparation of the test. Faculty members preparing the examination assume responsibility for its reading and grading, and for informing the adviser of results. Test results are reported by the program adviser to the Director of the Boston-Bouvé College Graduate School.

Each section of the examination is graded on the basis of A, B, C, or F. The candidate's total grade must average to the grade of B. Grades of F are not acceptable. A student failing all or part of the examination may, upon the recommendation of his adviser, be given one re-examination. Conditions governing re-examination are determined by the Director of the Graduate School or an appropriate designate.

Thesis

Each candidate must submit a thesis which clearly exhibits his research ability, and is designed to increase the scope of his individual specialization. The thesis proposal is submitted to the program adviser for approval. Upon initial approval, a thesis adviser and two additional committee members are appointed by the Director of the Graduate School at the recommendation of the program adviser. The thesis proposal and completed thesis must be approved by the thesis committee and the Director of the Graduate School.

financial information

FINANCIAL OBLIGATIONS

Tuition

Tuition rates and fees are subject to revision by the Board of Trustees at any time. However, any change in tuition and fees will become effective at the beginning of the school year which follows the one in which the change was announced. Tuition for master's degree candidates and special students is \$45 per quarter hour of credit.

Tuition statements are mailed to students by the Bursar's Office and are payable by check to Northeastern University on or before the date specified.

Fees

All applications must be accompanied by a nonrefundable application fee of \$15. No application will be processed until the fee has been received by the Graduate School of Boston-Bouvé College. Checks should be made payable to Northeastern University and sent, with the application, to Dr. Barbara Philbrick, 117 Dockser Hall.

Other fees include a charge of \$10 for late payment of tuition; a fee of \$2 for deferred tuition (with approval of Bursar); a final examination make-up fee of \$5; and a fee of \$25 for all degree candidates, payable before commencement by the applicable date listed on the academic calendar.

All part-time students on the Huntington Avenue Campus are charged \$.75 a quarter for the services available in the Student Center.

All financial obligations to the University must be discharged by graduation.

Refunds

Tuition refunds are granted only on the basis of the date appearing on the official withdrawal form filed by the student. Non-attendance does not constitute official withdrawal. Questions regarding refunds should be discussed with the Bursar's Office.

Refunds will be granted in accordance with the following schedule:

Official Withdrawal Filed Within:	Percentage of Tuition Refunded:
First week of quarter	100
Second week	75
Third week	50
Fourth week	25

FINANCIAL AID

There is a limited amount of financial aid for part-time students enrolled in Boston-Bouvé College Graduate School. Graduate assistantships and/or fellowships in the College are not available to part-time students. There are a limited number of teaching assistantships available to qualified full-time graduate students. Assigned duties require 18-20 hours per week for which the student receives a \$2,600 stipend and tuition waiver. Further information and applications may be obtained from the Boston-Bouvé College Graduate Office.

Martin Luther King, Jr., Scholarships

Established in 1969 in memory of the late Rev. Martin Luther King, Jr. Awards are made as openings occur to qualified minority graduate students who show financial need and are accepted to full-time study in the graduate schools of the University. Stipends will cover tuition and all fees.

Dormitory Proctorships

A number of proctorships in men's dormitories on or near the Huntington Avenue Campus are available each year. Appointments carry a minimum compensation of room and board. Further information and application forms may be obtained from the Office of University Housing.

National Direct Student Loan

This program is available to students who are carrying at least one-half the normal academic work load, are accepted as degree candidates, and who show evidence of financial need.

The Federal maximum which a graduate student may borrow while pursuing a post-baccalaureate degree is \$5,000.

Repayment and interest on these loans do not begin until nine months after the student ceases to carry at least a half-time academic load at an institution of higher education. The repayment of principal may be extended over a 10-year period with the interest at the rate of three percent per annum. Repayment may be deferred up to a total of three years while a borrower is serving as a Peace Corps or VISTA volunteer.

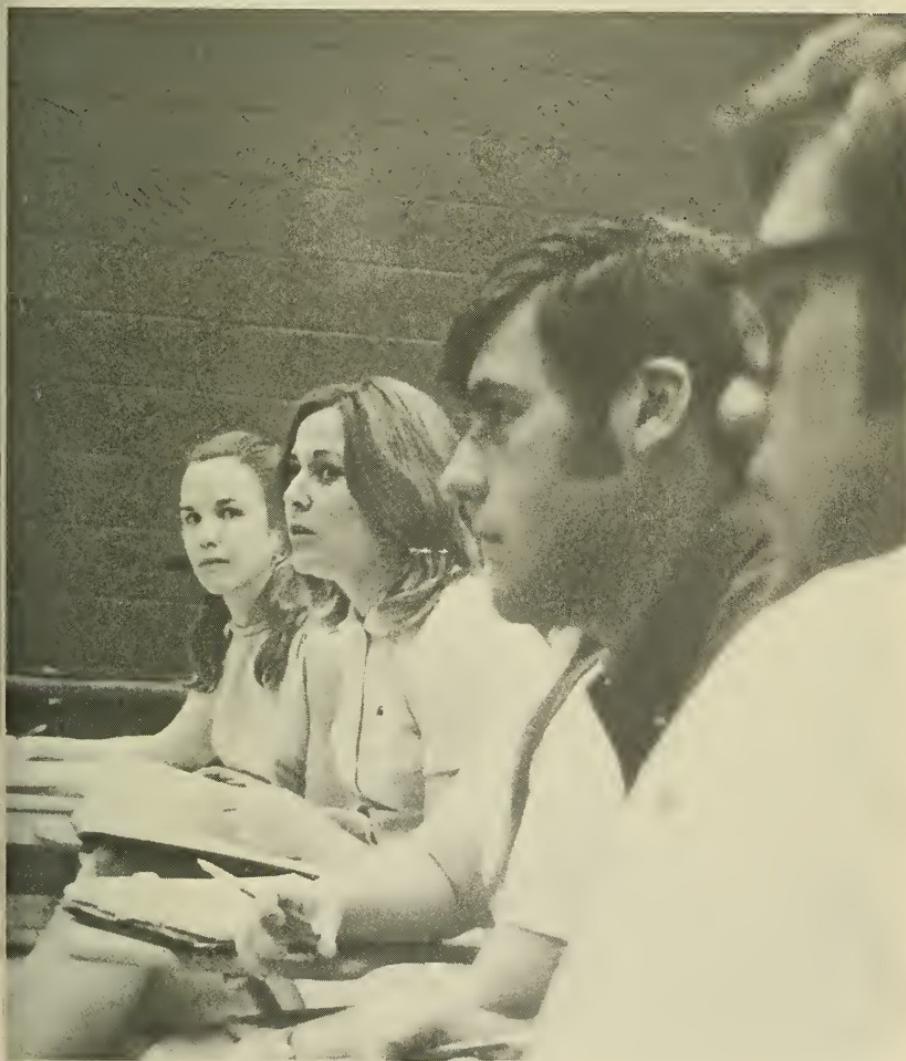
Guaranteed Student Loan Program

Under this program, students who are matriculated degree candidates, enrolled for at least one-half the normal academic work load, may borrow from a participating bank or other financial institution. Terms and conditions vary from state to state, but a student generally may borrow up to \$1,500 a year (the law allows a maximum of \$2,500 per year) de-

pending on financial need. The Federal government pays the interest while the student is in school if the student is eligible for interest subsidy.

The student must have submitted, through the College Scholarship Service, a Parents' Confidential Statement; or if he has been declared financially independent by the Financial Aid Office, a Students' Confidential Statement. These forms are available in the Financial Aid Office.

Applications for the loan itself are available from local banks or the Education Office of your state government. Additional information and necessary application forms for Massachusetts residents are available from the Financial Aid Office.





faculty

GRADUATE TEACHING FACULTY OF BOSTON-BOUVÉ COLLEGE

- Allen, Catherine L., B.S., M.A., Ed.D., Ph.D., *Dean of Boston-Bouvé College. Director of Boston-Bouvé College Graduate School, and Professor of Health, Physical Education and Recreation*
- Carlisle, Katherine, A.B., *Professor of Physical Therapy and Chairman of the Department; Lorraine C. Snell Professor in Health Care (1973-75)*
- Christensen, Carl S., B.S., M.S., Ph.D., *Professor of Physical Education and Chairman of the Department*
- Curtis, Joseph, B.S., M.S., *Visiting Lecturer in Recreation Education*
- Fox, John W., A.B., M.A., Ed.D., *Professor of Physical Education*
- Garrity, H. Marie, B.S.Ed., Ed.M., Ed.D., *Associate Professor of Health Education and Executive Officer of the Department*
- Jeffrey, Howard, A.B., M.A., D.R., *Associate Professor of Recreation Education*
- Kassabian, Kerkor, B.S., Ed.M., *Associate Professor of Physical Education*
- Luttgens, Kathryn, B.S., M.S., Ph.D., *Professor of Physical Education*
- McCay, Albert H., B.A., M.A., Ed.D., *Professor of Recreation Education and Chairman of the Department*
- McKenney, Joseph, A.B., M.A., Ed.M., *Visiting Lecturer in Physical Education*
- Morrison, Richard, B.A., M.S., Ed.D., *Associate Professor of Recreation Education*
- Philbrick, Barbara, B.A., M.S.Ed., Ph.D., *Associate Professor of Physical Education*
- Robinson, Frank, B.A., M.S., *Associate Professor of Recreation Education*
- Robinson, Sarah, B.S., M.S., *Associate Professor of Physical Education*
- Rowlands, Jeanne L., B.A., B.S., M.A., *Associate Professor of Physical Education*
- Sayed, Alae-Eldin, B.S., M.S., Ed.D., *Assistant Professor of Recreation Education*
- Shaffer, Kathryn, J., B.S., M.S., *Professor of Physical Therapy and Coordinator of Clinical Education*
- Vanderpool, Kenneth G., B.A., M.Ed., Ed.D., *Assistant Professor of Physical Education*
- Van Slyck, Elizabeth W., B.S., M.A., *Professor of Physical Therapy and Associate Chairman of the Department*
- Zobel, Richard C., B.S., M.A., Ed.D., *Professor of Physical Education*

fields of study

PROGRAMS IN PROFESSIONAL SPECIALIZATIONS **Master of Science**

Description

All students must complete one of the programs as outlined in the following pages. In almost all cases the sequence is designed to be very flexible. Any variations or changes must have the prior recommendation of the student's program adviser and approval of the Boston-Bouvé College Graduate School Director.

Core Courses Required of All Candidates

50.841 Introduction to Educational Statistics

66.802 or 50.815 Research Design in Physical Education and Recreation Education

66.890 Thesis I

66.891 Thesis II

Competency, as demonstrated by the successful completion of a proficiency examination, is accepted in lieu of Statistics and/or Research Design. The candidate must petition the Director of Boston-Bouvé College Graduate School for permission to attempt the proficiency examination. An elective course must be substituted for a core course which has been waived.

Specialization in Physical Education

For a specialization in Physical Education, 20 quarter hours of departmental courses are required. Eight quarter hours are selected from foundation courses taken within Boston-Bouvé College and 12 quarter hours from one of the four areas of concentration. In addition, 12 quarter hours of free elective courses appropriate to the student's program are selected from within Boston-Bouvé College or from other Colleges at Northeastern University. Foundation electives, areas of concentration, and the courses therein follow.

Foundation Electives within Boston-Bouvé College

62.870 Philosophies in Physical Education

62.872 Comparative Physical Education

62.874 Seminar in Issues and Trends in Education

62.875 Perspectives in Graduate Education

62.886 Critical Thinking and Evaluation in Physical Education

Areas of Concentration**Area I — Administration and Supervision**

- 62.810 Administration in Physical Education
- 62.812 Development and Maintenance of Facilities
- 62.814 Supervision in Physical Education
- 62.820 Athletic Administration
- 62.822 Problems in Contemporary Athletics for Men and Women

Area II — Curriculum and Instruction

- 62.830 Curriculum Development
- 62.833 Applied Evaluation in Curriculum and Instruction
- 62.835 Seminar in Curriculum and Instruction
- 62.840 Advances in Instructional Concepts
- 62.842 Physical Education for the Atypical Child
- 62.884 Movement and the Learning Process

Area III — Development and Learning in Movement and Perception

- 62.842 Physical Education for the Atypical Child
- 62.860 Early Childhood Movement Patterns
- 62.864 Perceptual Motor Development
- 62.884 Movement and the Learning Process
- 66.894 Independent Study (Movement Education Laboratory)

Area IV — Sports Medicine (non-clinical)

- 62.851 Anatomic Kinesiology
- 62.852 Mechanical Analysis of Sport
- 62.854 Physical Fitness Appraisal and Guidance
- 62.857 Trauma Diagnosis and Treatment in Sport
- 62.859 Rehabilitation from Injury in Sport
- 62.880 Sociology of Sport
- 62.882 Psychology of Coaching and Sport

Specialization in Recreation Education

To specialize in Recreation Education, four quarter hours of departmental course work are required. Each candidate is registered for either 3.812, Seminar in Contemporary Issues and Problems in Recreation Services or 63.830, Organization and Administration of Recreation Services. In addition, seven courses (28 quarter hours) appropriate to the student's needs and professional objectives are selected from the following list:

Community Recreation

- 63.834 Programs in Recreation
- 63.840 Recreation, Politics, and Bureaucracy
- 63.842 Recreation and the Community School
- 63.844 Leisure and Delinquent Behavior

Therapeutic Recreation

- 63.850 Introduction to Therapeutic Recreation Services
- 63.852 Recreation Services for Ill, Disabled, and Aging Persons
- 63.854 Observation of Recreation Services in Treatment Settings
- 63.856 Seminar in Outdoor Education for the Handicapped

Outdoor Education

- 63.824 School Camping
- 63.826 Administration of Resident Camp Programs
- 63.856 Seminar in Outdoor Education for the Handicapped

General Recreation Courses

- 63.810 Seminar in Literature and Research in Recreation
- 63.814 Grantsmanship
- 63.816 Management Information Systems
- 63.836 The Marketing of Recreation
- 63.838 Planning and Developing Recreation Facilities
- 66.894 Independent Study in Recreation Services
Selected Interdisciplinary Courses

Electives Offered by Boston-Bouvé College

- 66.899 Seminar/Workshop
- 66.901 Health Issues: Implications for Education
- 66.902 Toward Accountable Health Curriculum
- 66.903 Teaching Strategies: School and Community Health Education
- 66.904 Contemporary World Health
- 66.905 Environmental Health
- 66.906 Consumer Health

COURSES

DESCRIPTION OF COURSES

All courses carry four quarter hours of credit unless indicated otherwise. Please see the current brochure for summer, fall, winter, and spring quarter course offerings.

PHYSICAL EDUCATION

62.810 Administration of Physical Education

Exploration of principles and practices applied to elementary, junior, and senior high schools, and college physical education programs. Emphasis is placed on the interrelationship between education and physical education. Problems of personnel management, legal aspects, class scheduling, budgeting, and other administrative concerns are discussed.

Fall 1974

62.812 Development and Maintenance of Facilities

Consideration of principles, terminology, and standards for planning, construction, use, and maintenance of outdoor and indoor physical education and recreation facilities.

Spring 1975

62.814 Supervision in Physical Education

An investigation of the interpersonal relationships which effect improved instruction in physical education. Emphasis is placed on selected aspects of personality and human dynamics, job analysis, and teaching effectiveness, processes effecting change, and current problems in supervision.

Winter 1975

62.820 Athletic Administration

Standards and principles connected with the conduct of school and college athletics for both men and women. The course is intended to aid those persons responsible for both intramural and interschool athletic programs. Consideration is given to the welfare of participants, public relations, contracts, scheduling, conduct of tournaments, officials, and awards.

Summer 1975

62.822 Problems in Contemporary Athletics for Men and Women

Current problems, practices, and national issues pertinent to the conduct of athletic competition. National, state, and conference organizations are studied.

Winter 1976

62.830 Curriculum Development in Physical Education

The theory, practice, research, and evaluation of curriculum and curricular processes in American education. Special emphasis is placed upon elementary and secondary school programs of physical education and innovation in curricular designs.

Fall 1975

62.833 Applied Evaluation in Curriculum and Instruction

A practical approach to the application of current educational evaluation theory to concepts of instruction and curriculum development. Includes formative and summative techniques applied for the improvement of instruction, assessment of product and process in the educational program and teacher/learner interaction analysis. *Prep. 62.830, Curriculum Development or equivalent.*

Spring 1976

62.835 Seminar in Curriculum and Instruction

Problems of special interest in instructional theory, curriculum theory and applied evaluation theory. Practical papers and class presentations emphasize scholarship in the solution of educational problems or issues. *Prep. two courses from the Curriculum and Instruction concentration.*

Summer 1975

62.840 Advances in Instructional Concepts

Current practices in and a search for new approaches to all levels of instruction in physical education. Includes analyses of team teaching, the master teacher plan, programmed instruction, videotaped feedback, and other instructional aids and techniques.

Winter 1976

62.842 Physical Education for the Atypical Child

An investigation of techniques, equipment, methods, and graded programs for atypical children.

Spring 1975

62.851 Anatomic Kinesiology

A study of the human musculo-skeletal system and its relationship to human movement patterns. Electromyography is used in assessing muscle-movement relationships. Current electromyographic research and techniques are investigated.

Fall 1975

62.852 Mechanical Analysis of Sport

Application of mechanics of motion to the analysis of human motion. Emphasis is placed on cinematography and film analysis procedures in teaching and research. *Prep. 62.851, Anatomic Kinesiology or permission of instructor.*

Spring 1976

62.854 Physical Fitness Appraisal and Guidance

Physical fitness tests, developmental and rehabilitation programs, low fitness groups, fitness-producing activities, and current trends in testing and research. *Prep. Physiology and Measurement and Evaluation, or permission of instructor.*

Summer 1975

62.857 Trauma Diagnosis and Treatment in Sport

An investigation of injury pathology, evaluative testing, diagnosis, and appropriate treatment modalities. *Prep. Undergraduate Athletic Training or experience.* Spring 1976

62.859 Rehabilitation from Injury in Sport

Rehabilitation procedures and techniques appropriate to the post-injury retraining of athletes. *Prep. Adapted Physical Education or permission of instructor.* Summer 1974

62.860 Early Childhood Motor Patterns

The sequential development of fundamental motor patterns from age zero to 10 years. How to observe youngsters in a movement situation and assess their motor patterns. Fall 1974

62.864 Perceptual-Motor Development

An overview of major theories of learning and perception as they apply to learning and refining motor skills. The interrelationships of movement behavior and perceptual-motor organization of vision, audition, proprioception, kinesthesia, and psycho-social effects are studied. Winter 1975

62.870 Philosophies in Physical Education

An exploration of major philosophies, past and present, and their influence on modern physical education. The student delineates his personal philosophy, explores philosophical analysis as a research technique, and reviews philosophical research. *Prep. Philosophy, Philosophy of Education, or permission of instructor.* Spring 1975

62.872 Comparative Physical Education

Both past and present philosophies and practices of national and international programs in physical education are compared. Historical analysis is introduced as a research technique. Summer 1974

62.874 Seminar in Issues and Trends in Education

Analysis of current issues and trends in education and physical education, with emphasis on systematic and practical solutions, resolutions, and adaptations. Spring 1976

62.875 Perspectives in Graduate Education

Introduction to goals of graduate education study and research; their history, standards, and operating codes. The dimensions of and preparation for academic and professional disciplines, dimensions of science and the scientific method, professional and scientific research, scientific writing, and thesis format. Summer 1975

62.880 Sociology of Sport

An analysis of the sociological principles and factors operative in the interaction between sport and society. Pertinent literature and research

are reviewed. *Prep. General Sociology or permission of instructor.*

Winter 1975

62.882 Psychology of Coaching and Sport

Group dynamics, leadership, and mental and emotional values of sport. Emphasis is placed on stress, maturation, motivation, and learning as each relates to the teacher and participant. *Prep. General Psychology or permission of instructor.*

Winter 1976

62.884 Movement and the Learning Process

Major theories and research in learning and their application to learning motor skills. Perceptual-motor development and learning are examined; the programs evolving in this area and their implications for the teaching-learning process of motor skills are presented. *Prep. Educational Psychology or permission of instructor.*

Summer 1974

62.886 Critical Thinking and Evaluation in Physical Education and Recreation Education

Investigation of various approaches to the acquisition of knowledge and evaluation processes. Included are experiences in decision-making, logical and critical thinking, and test analysis.

Fall 1974

RECREATION EDUCATION

63.812 Seminar in Contemporary Issues and Problems in Recreation Services

Discussion of national and international issues, current trends, and contemporary problems as they affect recreation services.

Winter 1975

63.814 Grantsmanship

A seminar in which the student develops a grant proposal for submission to a funding source of his choice. Government and foundation grant programs are explored.

Fall 1974

63.816 Management Information Systems

The process of gathering, storing, and retrieving data for the purpose of making timely, accurate, organizational decisions. Emphasis is placed on decision-making in the areas of budget, service delivery, and staff effectiveness. Where appropriate, the systems are adapted for computer use at the community or agency level. Neither a mathematics nor computer background is necessary.

Winter 1975

63.824 School Camping

An independent study of the nature and conduct of outdoor recreation education as implemented in school camping programs. Problems investigated and methods developed under supervision of the faculty adviser and staff.

Spring 1975

63.826 Administration of Resident Camp Programs

An in-depth study of staffing, sanitation and health; purchasing and storage of food, materials, equipment, and supplies; kitchen management; insurance, construction, and maintenance of buildings; and program areas as they affect resident camping programs. A study of nationwide aims and trends in the camping movement is included. This course is conducted at Warren Center, Ashland, Massachusetts, as an intensive, residential, one-week workshop during the March quarter interim.

1975

63.830 Organization and Administration of Recreation Services

Patterns for the implementation of recreation service by school systems, voluntary agencies, national service organizations, municipal governments, and state and Federal agencies investigated in depth. Fall 1974

63.834 Programs in Recreation

An examination and evaluation of program content, leadership, administration, and facilities in recreation service, sponsored under public, private, religious, industrial, and voluntary auspices. Summer 1974, 1975

63.836 The Marketing of Recreation

Methods by which the underlying rationale and values of recreation can be effectively communicated to the public. Emphasis is placed on documenting the values of recreation. Spring 1975

63.838 Planning and Developing Recreation Facilities

The development by each student of a master plan for recreation in a city or town. Integrated planning among all municipal departments is stressed. Summer 1974, 1975

63.840 Recreation, Politics, and Bureaucracy

Practical problems faced by recreation professionals in public service are investigated. Students study relationships between elected officials, bureaucrats, peers, subordinates, and supervisors in state and local governments. Summer 1974, 1975

63.842 Recreation and the Community School

The concept of the role of recreation in community schools studied in depth. School visitation provides insight and discussion related to the characteristics, needs, programming, evaluation, and problems of various community schools. Spring 1975

63.844 Leisure and Delinquent Behavior

Recreation studied as an intervention strategy to prevent and rehabilitate delinquent behavior. Fall 1974

63.850 Introduction to Therapeutic Recreation Services

The type, nature, cause, and prognosis of different disabilities. The impact of disability on the individual, his family, and community, and the role of therapeutic recreation programs in rehabilitation are discussed.

Fall 1974

63.852 Recreation Services for Ill, Disabled, and Aging Persons

A study of recreation services in relation to progressive patient-care patterns; limitations on activity participation imposed by impairment or disability; effect of activity participation on these people. *Prep. 63.850.*

Winter 1975

63.854 Observation of Recreation Services in Treatment Settings

A guided observation under supervision of resident administrators in a clinical setting. Individual and group conferences are held with the instructor, and reports and readings assigned based on observations.

Spring 1975

63.856 Seminar on Outdoor Education for the Handicapped

A practical approach to outdoor education programs appropriate for the disabled who lack the advantage of summer programs. Experiences, activities, natural resources, and environmental conditions which relate to outdoor education are investigated.

Summer 1974, 1975

INTERDEPARTMENTAL COURSES

50.841 Introduction to Educational Statistics

Basic statistical techniques such as measures of central tendency, variability, probability, correlation and regression, chi square, t test, and analysis of variance are covered. This course is conducted by the Graduate School of Education in the College of Education. All Quarters

66.802 Research Design

Research methods and designs used in health, physical education, and recreation education, with emphasis on critical reading and understanding of research material. *Prep. 50.841, or permission of instructor.*

Winter and Summer Quarters

66.890 Thesis I

Initiation of a scholarly investigation under the auspices of the appropriate department. A written research proposal submitted to and approved by the student's thesis committee. *A student must have the permission of his program adviser before registering for this course.*

66.891 Thesis II

The investigation proposed in Thesis I implemented with and culminated in an approved written report in thesis form. In partial fulfillment of this

requirement, the student attends a series of research seminars. Upon completion, the candidate presents his thesis orally before the College seminar group. *Eight quarter hours for Thesis I and Thesis II.*

6.894 Independent Study in Physical Education or Recreation Education

Under the guidance and direction of his program adviser, each student develops and conducts a small project related to his professional interest which includes: a statement of problem or purpose, hypothesis, an exhaustive review of literature, an appropriate research design, a standard investigating instrument or one of his own design, a small sample of the population subjected to investigation, presentation and discussion of results, and a statement of conclusions. The project is reported in thesis format when appropriate. (Credit arranged with program adviser.) *Prep. permission of program adviser.*

6.899 Seminar/Workshop

The College may offer a special seminar or workshop from time to time in health, physical education, physical therapy, or recreation. Graduate credit may be granted for successful completion of a workshop, but credit may not be applied toward a degree program without the approval of the program adviser. All participants must be degree candidates in the Boston-Bouvé Graduate Program or must qualify, prior to registration, as special graduate students. Credit of one, two, three, or four quarter hours is determined by the workshop director. *Prep. permission of workshop director.*

6.901 Health Issues: Implications for Education

Identification and analysis of today's critical health issues. Increased educational involvement to fill the gap between current health knowledge and overt behavior.

6.902 Toward Accountable Health Curriculum

Exploration, assessment, and analysis of the professional team and selected health curriculum. Involvement of current educational philosophy to strengthen the ultimate goal of producing humane individuals by accountable health curriculum.

6.903 Teaching Strategies: School and Community Health Education

Essential contemporary strategies for achieving a humanizing base to reduce the time lag between relevant health information, action, values, and the modification of health behavior regarding school and community health education. Selected student projects in developing models for personal concerns.

66.904 Contemporary World Health

A survey of the state of the world's health, the progress which has been made, and the difficulties yet to be overcome. The importance of "partners in health," as compared to the solitary research worker, in reaching the current health needs. The contributions of WHO, UNESCO, UNICEF, and FAO.

66.905 Environmental Health

The study of some of the most serious problems facing mankind as man continues to pollute and ravage his environment. Student involvement in selected problem areas associated with air, water, and noise pollution; solid waste accumulation; and the use of pesticides and other pollutants.

66.906 Consumer Health

Analysis and evaluation of the concepts concerned with the careful selection of health products and services. Decision making relative to the selection of health products and services; evaluating advertising; quackery; protection against useless or dangerous products through consumer organizations as areas for student exploration and study projects.

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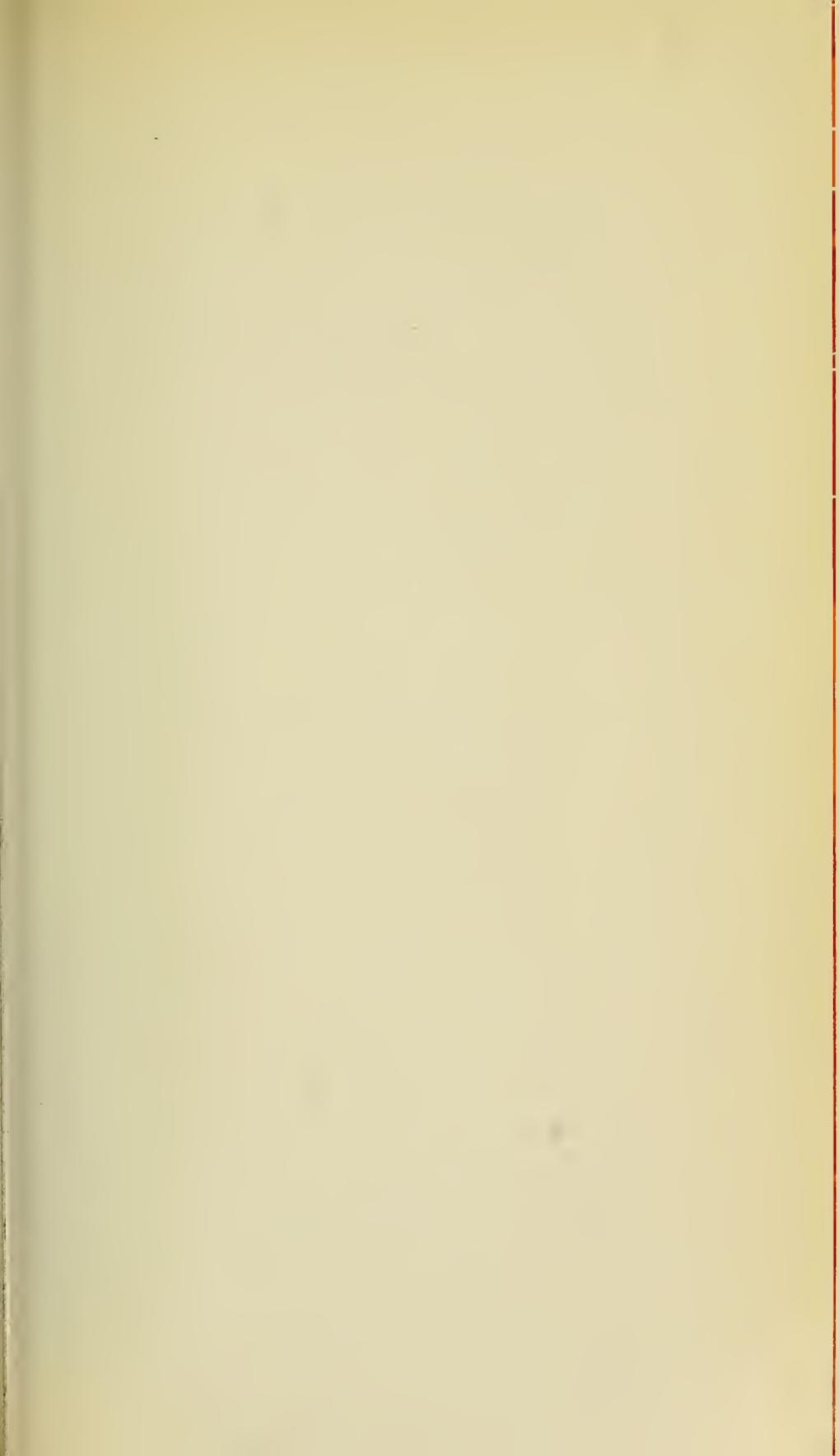
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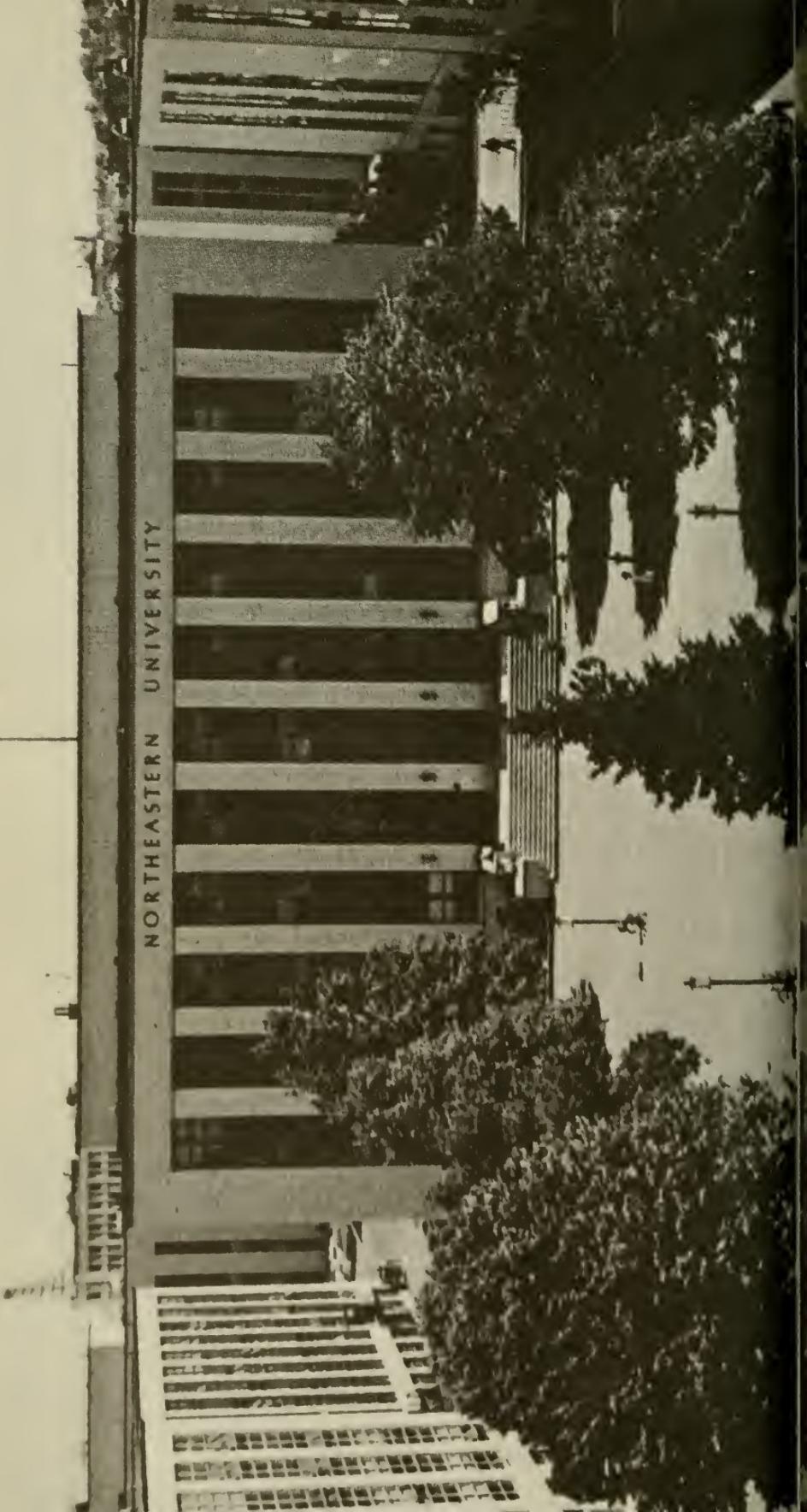


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NORTHEASTERN UNIVERSITY



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ACADEMIC CALENDAR 1974-1975

Fall Quarter 1974

Registration period (1:00-3:00 and 5:30-8:00 p.m.)

Burlington	Tuesday-Wednesday	Sept. 17-18
Boston	Monday-Thursday	Sept. 23-26
Interview period for new students by appointment*		
	Tuesday-Thursday	Sept. 17-26
Classes begin	Monday	September 30
Last day to drop a course	Wednesday	November 27
Examination period	Monday-Saturday	Dec. 16-21

Winter Quarter 1974-1975

Registration period (1:00-3:00 and 5:30-8:00 p.m.)

Burlington	Tuesday	Dec. 3
Boston	Monday-Thursday	Dec. 9-12
Interview period for new students by appointment*		
	Monday-Thursday	Dec. 9-12
Classes begin	Monday	January 6
Last day to drop a course	Saturday	March 8
Examination period	Monday-Saturday	Mar. 24-29

Spring Quarter 1975

Registration period (1:00-3:00 and 5:30-8:00 p.m.)

Burlington	Tuesday	March 11
Boston	Monday-Thursday	Mar. 17-20
Classes begin	Monday	April 7
Last day to file commencement card for June commencement		
	Tuesday	April 1
Last day to pay fee for June commencement		
	Wednesday	April 30
Last day to drop a course	Saturday	June 7
Final grades due in Registrar's Office for June graduates taking third quarter course		
	Friday	June 6
Examination period	Monday-Saturday	June 16-21
Spring commencement	Sunday	June 22

Examinations for day classes will be held in accordance with the undergraduate examination schedule.

*Appointments for interviews with new students must be made at least four days before the date of the interview.

UNIVERSITY HOLIDAYS 1974-1975

Columbus Day	Monday	October 14
Veterans' Day	Monday	October 28
Thanksgiving Recess	Thursday-Saturday	Nov. 28-Nov. 30
Christmas Vacation	Monday-Saturday	Dec. 23-Jan. 4
Washington's Birthday	Monday	February 17
Patriots' Day	Monday	April 21
Memorial Day	Monday	May 26
Independence Day	Friday	July 4
Labor Day	Monday	September 1

Equal Opportunity Policy

Northeastern University is committed to a policy of providing equal opportunity for all. In all matters involving admission, registration, and all official relationships with students, including evaluation of academic performance, the University insists on a policy of nondiscrimination. Northeastern University is also an equal opportunity employer; it is institutional policy that there shall not be any discrimination against any employee or applicant for employment because of race, color, religion, sex, age or national origin. In addition, Northeastern takes affirmative action in the recruitment of students and employees.



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Joseph M. Golemme, M.A., *Director of the Graduate School of Professional Accounting*
George W. Hankinson, M.S., *Director of the Graduate School of Engineering*
Linda D. Johnson, B.A., *Associate Registrar of the Graduate Schools*
John W. Jordan, M.Ed., *Director of the Graduate School of Business Administration*
Thomas J. Kerr, B.S.I.E., M.S.I.E., *Assistant Director of the Graduate School of Engineering*
Robert H. Ketchum, Ph.D., *Director of the Graduate School of Arts and Sciences*
John J. McKenna, M.A., *Assistant Director, Graduate School of Actuarial Science*
Norman Rosenblatt, Ph.D., *Director of the Graduate Program in Criminal Justice*
Philip J. Rusche, Ed.D., *Director of the Graduate School of Education*
Albert Soloway, B.S., Ph.D., *Director of the Graduate School of Pharmacy and Allied Health Professions*
Henry G. Tritter, M.Ed., *Coordinator of Admissions, Graduate School of Education*
Janice Walker, A.B., *Assistant Director of the Graduate School of Education*

University Graduate Council 1974-1975

The Council determines broad policies and regulations governing the conduct of graduate work. All new graduate programs must be approved by the Council.

OFFICERS

Arthur E. Fitzgerald, Chairman, *Vice President for Academic Affairs and Dean of Faculty*
John L. Neumeyer, Vice Chairman, *Chairman of the Executive Committee of the Graduate Council*
Sidney Herman, Secretary, *Associate Dean of Faculty*

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Catherine L. Allen, *Dean of Boston-Bouvé College and Director of Boston-Bouvé College Graduate School*
Philip T. Crotty, Jr., *Associate Dean of Business Administration*

George W. Hankinson, *Assistant Dean of Engineering and Director of the Graduate School of Engineering*
James S. Hekimian, *Dean of Business Administration*
John W. Jordan, *Associate Dean of Business Administration and Director of the Graduate School of Business Administration*
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Frank E. Marsh, *Dean of Education*
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Philip J. Rusche, *Associate Dean of Education and Director of the Graduate School of Education*
Robert A. Shepard, *Dean of Liberal Arts*

Elected Faculty Members

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Paul V. Croke, *Associate Professor of Management*
Ernest M. DeCicco, *Associate Professor of Economics*
David I. Epstein, *Professor of Mathematics and Chairman of the Department*
Austin Fisher, *Professor of Engineering Management*
Janis Z. Gabliks, *Associate Professor of Biology*
Blanche Geer, *Professor of Sociology*
George Goldin, *Professor of Special Education and Director of Rehabilitation Institute*
Bernard M. Goodwin, *Associate Professor of Chemical Engineering*
Albert Kovner, *Associate Professor of Education*
Robert C. Lieb, *Associate Professor of Management*
Morton Loewenthal, *Associate Professor of Electrical Engineering*
Wesley Marple, *Coordinator, Finance Group, and Professor of Finance*
Albert McCay, *Professor of Recreation Education and Chairman of the Department*
Harold Miner, *Associate Professor of Science Education*
John L. Neumeyer, *Professor of Medicinal Chemistry*
Irene Nichols, *Associate Professor of Psychology in Education*
Welville B. Nowak, *Snell Professor of Engineering*
Barbara Philbrick, *Associate Professor of Physical Education*
John D. Post, *Assistant Professor of History*
Robert Raffauf, *Professor of Pharmacognosy and Medicinal Chemistry*
John F. Reinhard, *Professor of Pharmacology*
Richard J. Scranton, *Assistant Professor of Civil Engineering*

Joseph Senna, Associate Professor of Criminal Justice
Albert Soloway, Chairman of the Department of Medicinal Chemistry and Pharmacology and Director of the Graduate School of Pharmacy and Allied Health Professions
Yogendra N. Srivastava, Associate Professor of Physics
Michael Terman, Associate Professor of Psychology
Dharmendra Verma, Associate Professor of Marketing
Elizabeth Van Slyck, Professor of Physical Therapy
Arthur Weitzman, Professor of English
Robert N. Wiener, Associate Professor of Chemistry
Richard Zobel, Professor of Physical Education

Administrative Committee of the Graduate Schools

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Francis W. Casey, Secretary, Registrar of the Graduate Schools
Catherine L. Allen, Director of Boston-Bouvé College Graduate School
Alvah K. Borman, Dean of Graduate Placement Services
Barbara Burke, Executive Assistant to the Dean of the School of Law and Director of Placement for the School of Law
Geoffrey Crofts, Director of the Graduate School of Actuarial Science
Philip T. Crotty, Jr., Associate Dean of Business Administration
Joseph M. Golemme, Director of the Graduate School of Professional Accounting
George W. Hankinson, Director of the Graduate School of Engineering
James S. Hekimian, Dean of Business Administration
John W. Jordan, Associate Dean of Business Administration and Director of the Graduate School of Business Administration
LeRoy C. Keagle, Dean of the College of Pharmacy and Allied Health Professions
Robert H. Ketchum, Assistant Dean of Liberal Arts and Director of the Graduate School of Arts and Sciences
Alan A. Mackey, Associate Dean of University Administration and University Registrar
Melvin Mark, Dean of Engineering
Frank E. Marsh, Jr., Dean of Education
Edmund J. Mullen, Assistant Dean of University Administration and Associate University Registrar
John C. O'Byrne, Dean of the School of Law
Barbara Philbrick, Associate Professor of Physical Education and Coordinator of Programs for Boston-Bouvé College Graduate School
Marianne Radziewicz, Registrar of the School of Law

Norman Rosenblatt, *Dean of Criminal Justice and Director
of the Graduate Program in Criminal Justice*

Philip J. Rusche, *Director of the Graduate School of Education*

Robert A. Shepard, *Dean of Liberal Arts*

Albert Soloway, *Director of the Graduate School of Pharmacy and Allied
Health Professions*

Ex Officio

Arthur E. Fitzgerald, *Dean of Faculty*

Loring M. Thompson, *Dean of Planning*

Committee of the Graduate School of Business Administration 1974-75

Joseph M. Golemme, *Cochairman, Professor of Accounting, and Director
of the Graduate School of Professional Accounting*

John W. Jordan, *Cochairman, Assistant Dean and Director of the Graduate
School of Business Administration*

James S. Hekimian, *Dean of the College of Business Administration*

Paul V. Croke, *Associate Professor of Management*

Robert H. Farrar, *Assistant Professor of Accounting and Management*

Michael Fetter, *Assistant Professor of Business Administration*

Victor Godin, *Assistant Professor of Business Administration*

Robert J. Minichiello, *Professor of Marketing*

Ralph C. Porter, *Associate Professor of Cooperative Education*

Raymond Ward, *Assistant Professor of Business Administration*

the university

Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under the General Laws of Massachusetts. The State Legislature by special enactment has given the University general degree-granting powers. The University is governed by a Board of Trustees elected by and from the Northeastern University Corporation, which is composed of nearly 180 distinguished business and professional men and women.

From its beginning, Northeastern University has had as its dominant purpose the discovery of community educational needs and the meeting of these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Cooperative Plan, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922), Liberal Arts (1935), Education (1953), Pharmacy (1962), Nursing (1964), Boston-Bouvé College (1964); the College of Criminal Justice (1967); and by Lincoln College's daytime Bachelor of Engineering Technology program (1971). This educational method enables students to gain valuable practical experience as an integral part of their college program and also provides the means by which they may contribute substantially to the financing of their education. The Plan has been extended to the graduate level in engineering, actuarial science, rehabilitation administration, professional accounting, business administration, and law.

In the field of adult education, programs of study have been developed to meet a variety of needs. University College offers evening courses — offered by the University since 1906 — and adult-day courses leading to the bachelor's degree. In addition to offering day undergraduate programs in Electrical Engineering Technology and Mechanical Engineering Technology, Lincoln College offers evening/part-time certificate, associate, and bachelor degree programs in technological areas. All formal courses of study leading to degrees through part-time programs are approved by the Basic College faculties concerned.

GRADUATE AND PROFESSIONAL SCHOOLS

The ten graduate and professional schools of the University offer day and evening programs leading to the degrees listed.

The Graduate School of Actuarial Science offers the degree of Master of Science in Actuarial Science.

The Graduate School of Arts and Sciences offers the degrees of Master of Arts, Master of Science, Master of Science in Health Science, Master of Public Administration, and Doctor of Philosophy.

The Graduate School of Boston-Bouvé College offers the degree of Master of Science, with specialization in Physical Education or Recreation Education.

The Graduate School of Business Administration offers the degree of Master of Business Administration.

The Graduate Program in Criminal Justice offers the degree of Master of Science.

The Graduate School of Education offers the degree of Master of Education and the Certificate of Advanced Graduate Study.

The Graduate School of Engineering offers the degrees of Master of Science, Engineer degree, Doctor of Engineering, and Doctor of Philosophy.

The School of Law offers the degree of Juris Doctor.

The Graduate School of Pharmacy and Allied Health Professions offers the degrees of Master of Science and Doctor of Philosophy.

The Graduate School of Professional Accounting offers the degree of Master of Science in Accounting.

CENTER FOR CONTINUING EDUCATION

The Center for Continuing Education was established in 1960 to relate the University to the needs of its community in a period of accelerated change. Adult education programs offered by the Center and University College have since been consolidated. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. The Division of Special Programs, working cooperatively with trade associations and professional societies, offers a wide variety of programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

RESEARCH ACTIVITIES

The facilities of the University are engaged in a wide variety of basic research projects in business, science, social science, pharmacy, and engineering. These are coordinated by the Dean of

Research, whose services are University-wide and available to the faculties of all the Colleges.

Although Northeastern is primarily concerned with undergraduate and graduate instruction, the University believes that the most effective teaching and learning take place in an environment characterized by research activities directed toward extending the frontiers of knowledge.



buildings and facilities

MAIN CAMPUS

The main campus of Northeastern University is located at 360 Huntington Avenue in the Back Bay section of Boston. Many of the city's famous cultural, educational, and philanthropic institutions are situated in the Back Bay, including the Museum of Fine Arts, Symphony Hall, Horticultural Hall, the Isabella Stewart Gardner Museum, the Harvard teaching hospitals, the Boston Public Library, and many schools and colleges. Most are within walking distance of Northeastern University.

Major transportation facilities serving the Boston area are Logan International Airport, two rail terminals, bus terminals serving inter- and intrastate lines, and MBTA subway-bus service within the metropolitan-suburban area. There is a subway stop in front of the campus. For motorists, the best routes to the campus are the Massachusetts Turnpike (Exit 22) and Route 9, of which Huntington Avenue is the intown section.

The campus of 48 acres is divided by Huntington Avenue, with the main educational buildings on one side and dormitories on the other. The principal buildings, all of which have been constructed since 1938, are of glazed brick in contemporary classic style. Most are interconnected by underground passageways.

EII Student Center

The Carl S. EII Student Center provides facilities for student recreation and for extracurricular activities. The Alumni Auditorium, with a seating capacity of 1,300, is part of the Center. Also included are special drama facilities, a ballroom, main lounge, fine arts exhibition area, student offices, conference rooms, and a dining area seating more than 1,000.

Libraries

The University library system consists of the Dodge Library, which is the main library; the Suburban Campus Library at Burlington; the School of Law Library; and divisional libraries for Physics and Electrical Engineering, Chemistry and Biology, Mathematics and Psychology, and Health, Physical and Recreation Education, and Physical Therapy. There are additional subject collections for the Center for Management Development at Andover, Massachusetts, and the Marine Science Institute in Nahant.

The library collections number 360,000 volumes supplemented by some 267,000 titles in microprint, microfilm, and microfiche forms. The collection includes, in addition, some 3,500 periodical titles, 90,000 documents, and 4,600 sound recordings.

Cabot Physical Education Center

The Godfrey Lowell Cabot Physical Education Center is one of the best equipped in New England. The large gymnasium contains four basketball courts. In addition, the Center consists of an athletic cage, a small gymnasium, and a rifle range, as well as administrative offices for the Department of Athletics and for the Physical Education Department of Boston-Bouvé College.

A recent addition to the center, the Barletta Natatorium, houses a 105-foot swimming pool, a practice tank for the crew, handball courts, and shower and dressing facilities.

Dockser Hall

Charles and Estelle Dockser Hall, completed in 1968, houses a large gymnasium, dance studio, motor performance laboratory, college library, community recreation laboratory, folk arts center, dark and music rooms, recreation resources area, locker rooms, offices, classrooms, conference room and lounge, storage facilities, and a research laboratory.

Apartments for Graduate Students

The University maintains a 100-apartment housing unit which accommodates 279 people. Two-, three-, and four-party apartments are available which vary in size from two to four rooms plus bath. Apartments are furnished with beds, chairs, desks, stove, refrigerator, and kitchen table. The cost includes all utilities.

A \$50 deposit is required when making application for the apartments. Applications are available in the Office of University Housing. Students are expected to make such arrangements on a term-to-term basis but may live in the apartments both while on cooperative work assignments and in school if they wish. All reservations are made on a first come, first served basis.

SUBURBAN FACILITIES

Suburban Campus

The Suburban Campus, located near the junction of Routes 128 and 3 in Burlington, Massachusetts, was established to meet the needs of individuals and of industry in the area.

In addition to graduate courses in engineering, physics, mathematics, business administration, science, education, and the arts, portions of undergraduate programs leading to the associate and bachelor's degrees, special programs for adults, and noncredit state-of-the-art programs are offered.

portions of undergraduate programs leading to the associate and bachelor's degrees, special programs for adults, and noncredit state-of-the-art programs are offered.

Warren Center

The Warren Center is a practical laboratory for Boston-Bouvé College in outdoor education and conservation, in group practicum, and in camping administration, programming, and counseling. At this Center in Ashland, completed in 1967, there are tennis courts, field hockey and lacrosse fields, waterfront for swimming and boating, overnight camp sites, fields and forests, heated cottages, the Hayden Lodge with a recreation hall, library, crafts shop, dining facilities, and conference accommodations.

Henderson House

The University's conference center, Henderson House, is located in Weston, Massachusetts. The Center for Continuing Education conducts short-term courses, seminars, and special institutes for business, professional, and research groups. Henderson House is 12 miles from the main campus.

Marine Science Institute

The Marine Science Institute at Nahant, Massachusetts, is a research and instructional facility primarily engaged in studies of marine biology and oceanography. The Institute is operated all year, and is about 20 miles northeast of Boston. Many of the courses at this institute are applicable toward an advanced degree in biology or health science.

Brockton, Nashua, and Framingham Campuses

For students residing in southeastern Massachusetts and northeastern Rhode Island, the Graduate School of Business Administration offers a significant portion of its M.B.A. Program at facilities in Brockton, Massachusetts. These facilities, made available by the Knapp Corporation, are located on West Chestnut Street in Brockton.

Students residing in the southern New Hampshire area may take a significant portion of the M.B.A. Program at facilities in Nashua, New Hampshire. These facilities are furnished by Sanders Associates, Inc. and are located in their headquarters on Route 3, just over the Massachusetts line.

For students in the Framingham-Worcester area, a significant portion of the M.B.A. Program may be taken at classroom facilities located in Framingham, Massachusetts.

graduate school of business administration

The Graduate School of Business Administration at Northeastern University offers a program leading to the degree of Master of Business Administration. Broad in concept, the program is aimed at preparing the student for a career in administration rather than for an immediate or particular position. The curriculum and teaching methods center around the development of basic skills and knowledge appropriate to administration, rather than emphasizing specialized functional techniques. Although the case method of study is used extensively, a variety of teaching methods is employed that is consonant with particular course objectives. The basic objectives of the program are to increase skills and knowledge in basic disciplines underlying administrative practice, and to develop judgment and skills of problem analysis and decision making in complex organizations.

There is no prescribed undergraduate background recommended for admission. Undergraduate experiences typically include literature and the arts, mathematics and the sciences, and engineering and other applied fields. The program provides all managerial preparation appropriate to a graduate business curriculum. Flexibility allows for more intensive work in a specialized area or more general study in several fields to accommodate specific needs.

The student may choose one of four methods of securing an M.B.A. degree: full-time internship, full-time non-internship, full-time assistantship, and part-time study.

FULL-TIME STUDY

Internship

A feature which makes the Northeastern M.B.A. Program unusual in graduate education is the management internship. Following the philosophy that a balanced exposure to theory and practice is the most effective approach to management education, the 18-month program is in accord with this approach. Class work begins with basic disciplines vital to sound progress in a management-oriented course. The functional areas of business are treated next, with process courses and electives following.

This program encompasses six months of work experience in the world of business and management and 12 months of classroom study. The intern student is employed in a professional capacity within an organizational environment which provides both a realistic experience and a major source of funds for continuance of the program. The nature of the job assures ample opportunity to observe some aspect, element, or problem of the organization.

Because of economic, academic, and individual variables, the Graduate School cannot guarantee placement; however, the University has a full-time experienced staff to assist the student in obtaining his internship. A student is also encouraged to investigate employment opportunities on his own in order to facilitate final placement by the intern coordinator.

For students entering class in June an illustration of term sequence within the 18-month internship program is shown below.

	1st Year	2nd Year
SUMMER QUARTER	In Class	In Class
FALL QUARTER	In Class	In Class
WINTER QUARTER	Management Internship	In Class
SPRING QUARTER	Management Internship	

During each academic quarter the student normally carries 18 quarter hours of credit.

Thus, the full-time internship blends one full calendar year of academic study with six months of coordinated work as an intern in a business or nonprofit organization. This combination of theory and practice gives the intern excellent preparation for a career in management.

Non-internship

The full-time, non-internship allows students wide latitude in determining their pace toward the M.B.A. degree. Although most students take four courses each quarter, some take as many as five or six courses. This enables a candidate to complete degree requirements in a period from one calendar year to two academic years.

Assistantship

Under the full-time assistantship, students combine their studies with academic experience in the College of Business Administration. A student may be a teaching assistant, a graduate administrative assistant, or a tuition assistant. Appointees to these positions work directly with members of the faculty and staff of the College of Business Administration. This work affords the student interested in developing a college or university career the opportunity to explore and gain experience in teaching, research, or administration.

Teaching assistants and graduate administrative assistants receive remission of tuition and a stipend of \$2,600 in return for devoting their time respectively to assisting directly in the teaching process or in administrative duties within the College. These appointees must not take less than a half-time academic load in the M.B.A. Program. Assistants who are in the second year of study and receive a reappointment are paid a stipend of \$2,900.

Tuition assistants receive remission of tuition in return for sharing in the administrative work of the College. These awards are normally given to full-time, non-intern students in their first year of graduate work. Tuition assistants devote eight hours a week to their assigned administrative work.

PART-TIME STUDY

Part-time students may continue their full-time employment while acquiring the background, skills, and knowledge that will help them advance their careers in administration.

These students normally take two courses per quarter and may complete the degree program in three to four years, depending upon whether course work is taken during the summer quarter. All degree requirements may be completed at the Boston or suburban campuses.

Students maintaining a satisfactory academic standing may petition the Director of the Graduate School of Business Administration for permission to take more than two courses per quarter.

Thus, part-time students have the advantage of attending classes in the late afternoon and evening to learn the theory behind the practical application of their employment.

APPLICATION INFORMATION AND PROCEDURE

All applicants should address inquiries to the Graduate School of Business Administration. Application forms and reference blanks will be mailed to them. This material, together with one official transcript, the Admission Test for Graduate Study in Business (ATGSB) scores, and the results of the Test of English as a Foreign Language (TOEFL, required by all applicants whose native language is not English), should be returned to:

Northeastern University
Graduate School of Business Administration
224 Hayden Hall
Boston, Massachusetts 02115

Applications for the ATGSB Examination can be obtained by writing to:
Educational Testing Service
Box 966
Princeton, New Jersey 08540

Applications for the TOEFL Examination can be obtained by writing to:
Educational Testing Service
Box 899
Princeton, New Jersey 08540

Full-time non-internship, internship, and assistantship applications should be submitted by April 1.

Applications for part-time study must be completed no later than two weeks prior to the registration period for the quarter in which the applicant plans to enter the M.B.A. Program.

To be admitted for graduate work in the College of Business Administration, applicants must have completed undergraduate work of high quality and must have obtained a bachelor's degree from a recognized institution of higher learning. The overall quality of undergraduate achievement is considered to be of more importance than the particular field of specialization. Official transcripts of all previous undergraduate and graduate work must be submitted to the Graduate School of Business Administration before admission can be considered or an evaluation made.

Applicants are also required to submit three letters of reference from individuals who are familiar with their qualifications for graduate study in business administration.

The basic criteria considered in the admissions procedure are: undergraduate grades, previous graduate work, the score on the Admission Test for Graduate Study in Business, job experience, and present job level. An overall impression of strength, past success, and motivation to succeed in the Graduate School is sought in the applicants for the program.

Although the M.B.A. Program presumes no particular level of competence in the areas of accounting, economics, statistics, mathematics, and behavioral science, prospective applicants are advised to acquire some background in these areas in their undergraduate work.

GENERAL REGULATIONS

The general regulations and minimum requirements for all graduate programs are established by the Northeastern University Graduate Council. In some matters the committee of each graduate school is allowed discretion to establish regulations within limits defined by the Council. The regulations and academic requirements which follow have been formulated in accordance with this general policy.

Academic Requirements

In order to qualify for the M.B.A. degree, an average grade of B must be obtained in the total credit hours required for graduation. No more than three extra courses or repeated courses may be taken in order to satisfy this grade requirement.

Any student who receives a grade of less than B in four or more degree credit courses may be withdrawn from the program by action of the Committee of the Graduate School of Business Administration.

Within the above limitations, a required course for which a grade of I or F is received must be repeated with a grade of C or better, and may be repeated only once. If a grade of I or F is received in an elective course, that course may be repeated once with a grade of C or better, or another elective course may be substituted for it. If a grade of C is received in a required course, that course may be repeated once to obtain a grade of B or better.

The continuing development of the Graduate School forces frequent revision of curricula. In every new bulletin some revisions are indicated. When no hardship is imposed on the student because of changes, and when the facilities of the school permit, the student is expected to meet the requirements of the latest bulletin.

Application for the Degree

A commencement card must be filed with the Registrar's Office before the date specified on the University calendar. This assures the student's graduation the same year all degree requirements are completed. Prompt filing of the commencement card also insures the correct spelling on the diploma.

Classifications

Students initially entering the M.B.A. Program are classified into one of two groups depending upon their admission credentials.

Regular Students are those individuals who meet in full all admittance standards established by the Committee on Graduate Study in Business Administration.

Students in the Program for Advanced Study in Business Administration are those who already hold an M.B.A. degree. See page 45 for full information.

Continuity of Program

Students are expected to maintain continuous progress toward a degree. Any student who does not attend Northeastern for a period of one quarter without notifying the program director will be classified as inactive.

All inactive students must submit a written petition to the director of the program in order to be readmitted to graduate study. Petition forms may be obtained in Room 224 Hayden Hall.

Credits and Class Hours

All credits at Northeastern University are entered as quarter-hour credits, with a quarter hour of credit being equivalent to three fourths of a semester hour: i.e., 12 semester hours equal 15 quarter hours.

All classes in the Graduate School of Business Administration meet on a quarter basis, with an academic quarter defined as a term of approximately 12 weeks' duration. In the summer quarter, classes meet in two six-week sessions. The academic calendar at the front of this bulletin should be consulted to determine the opening dates of each quarter.

A minimum of 11 classes must be scheduled for each course during the fall, winter, and spring quarters. In a split summer session (5 and 6 weeks), a minimum of 10 classes must be scheduled in the first 5 weeks and a minimum of 11 classes in the second 6 weeks.

Grading System

The performance of students in graduate courses will be recorded by the instructor through use of the following grades:

A Excellent

This grade is given to those students whose performance in the course has been of very high graduate caliber.

B Satisfactory

This grade is given to those students whose performance in the course has been at a satisfactory level.

C Fair

This grade is given to those students whose performance in the course is not at the level expected in graduate work.

F Failure

This grade is given to those students whose performance in the course is unsatisfactory.

In addition, the following letter designations are used:

I Incomplete

This grade is given to those students who fail to complete the work of the course.

S Satisfactory

This grade is given to those students who fulfill the requirements of the course without a specific grade designation.

U Unsatisfactory

This grade is given to those students who do not meet the requirements of the course, although no specific grade designation is made.

These grades are used for the first quarter of a two-quarter sequence in which the grade for the second quarter applies to both the first and second quarters of the sequence.

The designation I will be changed to a grade upon removal of the deficiencies which caused the grade of I to be reported. Deficiencies must be made up within the quarter following that for which the grade of I is received, unless the instructor grants an extension of time. However, such extension may not exceed two additional consecutive calendar quarters.

A make-up final examination period will be scheduled by the Graduate School of Business Administration during the sixth week of each quarter. Any student who wishes to take a make-up examination must obtain permission of the Director of the Graduate School of Business Administration by the second week of the quarter succeeding that in which the examination was missed. The make-up examination must be taken in that succeeding quarter unless circumstances warrant the Director's permission to defer it to one of the next two quarters.

Registration

Part-time students must register during the periods listed on the school calendar. Dates of registration are specified by letter for students accepted or full-time study.

Residence

All work for advanced degrees must be completed in residence at the University, unless approval has been obtained from the Director of the Graduate School of Business Administration for work taken elsewhere. Students who are in residence and are using the facilities of the University must register for such work.

Time Limitation

Course credits earned in the program of graduate study, or accepted by transfer, are valid for a maximum of seven years.

Transfer Credit

A maximum of 15 quarter hours of graduate credit obtained at another institution may be accepted toward the master's degree, provided that the credits transferred carry grades of A or B, have been earned at a recognized institution, have not been used toward any other degree, and are relevant to the M.B.A. Program. Students should petition the Graduate School of Business Administration in writing for all transfer credit. Petition forms may be obtained in Room 224 Hayden Hall. Grades on transfer courses are excluded in the computation of the academic average necessary for the completion of the degree requirements.

Vaiver of Courses

Certain required courses may be waived if a student can demonstrate that the course material would be a repetition of previous academic training. Course waivers are subject to faculty approval and do not entitle a student to transfer credit. An elective must be substituted for each required course which is waived. Questions concerning course waivers should be directed

to the Director of the Graduate School of Business Administration at least 30 days prior to the quarter in which the student is scheduled to take the course.

Withdrawals

In order to withdraw from a course, a student must submit an official withdrawal form obtained at the Registrar's Office or at the Suburban Campus Main Office. Withdrawals may be made through the ninth class meeting of the quarter. Students are withdrawn as of the date on which they submit the form. Ceasing to attend a class or notifying the instructor does not constitute an official withdrawal.

Petitions for withdrawal from a course after the ninth class meeting of the quarter must be submitted to the Director of the Graduate School, and may be approved to avert unusual hardships on a student. Petition forms may be obtained in Room 224 Hayden Hall.

financial information

FINANCIAL OBLIGATIONS

Tuition

Tuition for master's degree candidates and special students is \$55.00 per quarter hour of credit. Since each graduate course is three credit hours, the cost for each course is \$165.00.

Tuition statements are mailed to students by the Bursar's Office and are payable by check to Northeastern University on or before the date specified.

Fees

All applications must be accompanied by an application fee (nonrefundable) of \$15.00. No applications will be processed until the fee has been received by the Graduate School of Business Administration. Checks should be made payable to Northeastern University and sent directly to the Office of the Graduate School of Business, 224 Hayden Hall.

Upon notification of admission, all full-time applicants are required to pay a tuition deposit of \$50.00. This deposit is credited to the student's tuition, and is not refundable for those who do not register.

Other fees include: a charge of \$10.00 for late payment of tuition; a final examination make-up fee of \$5.00; and a fee of \$25.00 for all degree candidates, payable before commencement by the applicable date listed on the academic calendar.

For full-time students there is a charge of \$12.50 per quarter for the services available in the Student Center. The fee for tuition assistants, teaching assistants, and administrative assistants is \$6.25 each quarter. All part-time students on the Huntington Avenue Campus are charged \$.75 a quarter.

All full-time students will pay a nonrefundable University Health Services fee of \$75.00 each year. This fee provides Blue Cross-Blue Shield coverage and entitles the student to the medical care furnished by the University Health Services.

All financial obligations to the University must be discharged before graduation.

Refunds

Tuition refunds are granted only on the basis of the date appearing on the official withdrawal form filed by the student. Nonattendance does not constitute official withdrawal. Questions regarding refunds should be discussed with the Bursar's Office.

Refunds will be granted in accordance with the following schedule:

<i>Official Withdrawal Filed Within</i>	<i>Percentage of Tuition Refunded</i>
First week of quarter	100
Second week of quarter	75
Third week of quarter	50
Fourth week of quarter	25

FINANCIAL AID

The Graduate School of Business Administration grants financial aid in the form of assistantships, internships and Sloan scholarships. A description of assistantships and internships can be found on page 27. The Sloan program is described below. Northeastern University also has a limited amount of financial aid for full-time students enrolled in the Graduate School of Business Administration. Information in addition to that below, and application forms, are available from the Northeastern Office of Financial Aid. These forms are not available in the Graduate School of Business Administration Office.

Dormitory Proctorships

A number of proctorships in men's dormitories on or near the Huntington Avenue Campus is available each year. Appointments carry a minimum compensation of room and board. Further information and application forms may be obtained from the Office of University Housing.

Guaranteed Student Loan Program

Under this program, students who are matriculated degree candidates, enrolled for at least one-half the normal academic work load, may borrow from a participating bank or other financial institution. Terms and conditions vary from state to state, but a student generally may borrow up to \$1,500 a year (the law allows a maximum of \$2,500 per year) depending on financial need. The Federal government pays the interest while the student is in school if the student is eligible for interest subsidy.

The student must have submitted, through the College Scholarship Service, a Parents' Confidential Statement; or if he has been declared financially independent by the Financial Aid Office, a Students' Confidential Statement. These forms are available in the Financial Aid Office.

Applications for the loan itself are available from local banks or the Education Office of your state government. Additional information and necessary application forms for Massachusetts residents are available from the Financial Aid Office.

Martin Luther King, Jr., Fellowships

A limited number of full-time Martin Luther King, Jr., Fellowships are available. Holders of these appointments devote full time to graduate work.

National Direct Student Loan

This program is available to students who are carrying at least one-half the normal academic work load, are accepted as degree candidates, and who show evidence of financial need.

The Federal maximum which a graduate student may borrow while pursuing a post-baccalaureate degree is \$5,000.

Repayment and interest on these loans do not begin until nine months after the student ceases to carry at least a half-time academic load at an institution of higher education. The repayment of principal may be extended over a 10-year period with the interest at the rate of three percent per annum. Repayment may be deferred up to a total of three years while a borrower is serving as a Peace Corps or VISTA volunteer.

The Sloan Scholarship Program

The Sloan Program provides funding for certain minority students who are pursuing the MBA degree on a part-time basis. Under terms of the grant, minorities eligible for funding are Americans who are black, Spanish speaking, or of oriental descent. By attending classes in the late afternoon and evening, part-time students combine practical work experience from their regular responsibilities with appropriate theoretical knowledge.

Qualified students who have been out of school at least five years and feel their career progress has not fulfilled expectations should apply. Additional graduate study leading to an MBA degree facilitates career progress.



faculty

- Robert F. Abbanat**, *Lecturer in Business Administration*; B.S., M.S., Massachusetts Institute of Technology; M.B.A., D.B.A., Harvard University
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- Herman Rochwarg**, *Associate Professor of Management*; B.A., Ph.D., Michigan State University
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- Daniel C. Scioletti**, *Associate Professor of Business Law*; B.B.A., Colby College; LL.B. Suffolk University; Ed.M., Boston University
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Frederick Wiseman, *Associate Professor of Marketing*; B.S., Tufts University; M.S., Ph.D., Cornell University



master of business administration curriculum

Candidates for the degree of Master of Business Administration must complete successfully 24 courses (72 quarter hours of credit), 17 of which are required courses and 7 are elective courses.

Required Courses

<i>Number</i>	<i>Courses</i>	<i>Credit Hours</i>
41.811	Financial and Managerial Accounting	3
41.812	Control I	3
41.813	Control II	3
43.811	Marketing Management I	3
43.812	Marketing Management II	3
44.811	Financial Management I	3
44.812	Financial Management II	3
45.805	Operations Management I	3
45.806	Operations Management II	3
45.815	Behavioral Concepts	3
45.816	Organizational Behavior I	3
45.817	Organizational Behavior II	3
45.836	Policy: the Social, Political, Economic, and Legal Environment	3
45.837	Policy: the Formulation and Implementation of Strategy	3
49.901	Managerial Economic Analysis	3
49.902	Quantitative Analysis I	3
49.903	Quantitative Analysis II	3
	Total Required Credit Hours	51
	Elective Credit Hours	21
	Total Credit Hours for Degree	72

Elective Courses

In addition to the required courses, students must complete course work in electives to bring their total program to the 72 quarter hours of credit required for the Master of Business Administration degree. All elective courses carry three quarter hours of credit unless otherwise specified.

Courses may also be selected from other graduate programs at North-eastern University with the permission of the director of the appropriate program and the Director of the Graduate School of Business Administration.

Administration and Its Environments		
39.805	Business Cycles and Forecasting	44.935 Management of Financial Institutions
39.823	Government Finance	
39.825	Fiscal Policy	General Management
39.831	Money and Banking	45.811 Purchasing and Materials Management
39.835	Labor Economics	45.828 Seminar in Growth Strategies for Corporate Management
41.862	Tax Factors in Business Decisions	45.830 Formal Planning Systems
45.821	Policy Formation in Non-Business Institutions	45.839 Women Managers
45.841	Public/Private Service Systems	45.997 Special Topics in Business Administration (1 to 3 Q.H.)
45.962	Institutional Environment of Business I	45.998 Administration (1 to 3 Q.H.)
45.964	Institutional Environment of Business II	45.999 Administration (1 to 3 Q.H.)
45.969	Government and Business	49.932 Introduction to Computer Applications
45.989	Science and Technology: The Challenge of Management	49.933 The Computer and Its Applications II
45.991	Business Law—Law of Contracts, Agency and Sales	49.935 Computer Applications in Management Science
45.992	Law of Business Organizations and Negotiable Instruments	
Financial Management		Health Care Administration
44.814	International Financial Management	45.808 Comparative Management
44.816	The Management of Financial Resources	45.833 Operations Management in the Health Care System
44.818	Working Capital Management	45.838 Policy Formation in Health Care
44.901	Finance III—Advanced Financial Management	45.975 Introduction to Health Care Systems
44.921	Investment Analysis	45.976 Workers in the Health Care System
44.924	Mergers and Negotiable Instruments	45.977 Information Systems for Health Care Facilities
		49.918 Information Theory and Systems

International Business Management

- 39.827 Economic Development
 39.829 Comparative Economic Systems
 39.833 International Economics
 44.814 International Financial Management

Marketing Management

- 43.814 Consumer Behavior
 43.910 International Marketing
 43.925 Sales Management
 43.926 Advertising Management
 43.931 Marketing Research
 43.934 New Product Development
 43.936 Strategy Problems of Mass Distributors
 43.937 Marketing in the Public Sector
 43.941 Industrial Marketing

Management of Human Resources

- 45.808 Comparative Management
 45.819 Interpersonal Behavior
 45.820 Psychological Dynamics of Leadership
 45.823 Career Planning and Development
 45.824 Organizational Behavior in a Non-Profit Environment
 45.835 Seminar in Organizational Development
 45.951 Executive Development
 45.971 Personnel Management
 45.972 Labor Relations
 45.973 New Sectors of Collective Bargaining
 45.976 Workers in the Health Care System
 45.985 Management of Research and Development
 45.993 Labor Law

Operations Management

- 45.809 Advanced Operations Management
 45.833 Operations Management in the Health Care System
 45.902 Planning and Control of Manufacturing Operations
 45.965 Management of Small Business Enterprises
 49.904 Contemporary Problems in Managing Complex Operating Systems
 49.907 Operations Management Game

Management of Transportation and Logistics

- 48.801 Seminar in Inter-city Transportation
 48.805 Urban Transportation
 48.901 Physical Distribution Management

Small Business Management

- 45.829 New Ventures: A Career Choice
 45.965 Management of Small Business Enterprises
 45.968 Management of New Enterprises

Managerial Control

- 41.815 Management Control Systems
 41.816 Management Control of Health Service Systems
 41.825 Management Performance Appraisal
 41.862 Tax Factors in Business Decisions

Recommended Part-Time Program

While the part-time student has some flexibility in the order in which he takes his required work, the schedule below is recommended as a guide:

<i>Quarter</i>	<i>Number</i>	<i>Course</i>
1st	41.811	Basics of Financial and Managerial Analysis
	45.815	Behavioral Concepts
2nd	41.812	Control I
	45.816	Organizational Behavior I
3rd	41.813	Control II
	45.817	Organizational Behavior II
4th	49.901	Managerial Economic Analysis
	49.902	Quantitative Analysis I
5th	49.903	Quantitative Analysis II
		Elective
6th	43.811	Marketing Management I
	44.811	Financial Management I
7th	43.812	Marketing Management II
	44.812	Financial Management II
8th	45.805	Operations Management I
		Elective
9th	45.806	Operations Management II
		Elective
10th	45.836	Policy: the Social, Political, Economic, and Legal Environment
		Elective
11th	45.837	Policy: the Formulation and Implementation of Strategy
		Elective
12th		Elective
		Elective

OTHER GRADUATE-LEVEL PROGRAMS IN BUSINESS

The Center for Management Development

The Center for Management Development offers the Management Development Program, designed for experienced managers who have had responsibility for a major task, function, department, division, or independent enterprise. Its general aim is to improve the manager's overall performance.

There is a choice of two six-week sessions spaced over five months, October through February or January through May. Participants attend two consecutive weeks of classes at the outset, and thereafter one week in each of the remaining four months. This approach offers a tested

alternative to organizations which recognize the need for management training, but find it difficult to release a key man for long periods of study. A certificate is awarded upon successful completion of course work.

Management Development Program

The Management Development Program is a graduate-level course in business, designed for experienced managers who have had responsibility for a major task, function, department, division, or independent enterprise. Its general aim is to improve the manager's overall performance.

There is a choice of two six-week sessions spaced over five months, October through February or January through May. Participants attend two consecutive weeks of classes at the outset and thereafter one week in each of the remaining four months. This approach offers a tested alternative to organizations which recognize the need for manager training but find it difficult to release a key man for lengthy periods of study. A certificate is awarded to all who successfully complete the course work.

Graduate School of Professional Accounting

The Graduate School of Professional Accounting offers a 15-month program for non-accounting majors that leads to the degree of Master of Science in Professional Accounting. This unique program combines 12 months of class work with a three-month internship in a public accounting firm.

Information may be obtained by writing to:
Graduate School of Professional Accounting
206 Hayden Hall
Northeastern University
Boston, Massachusetts 02115

The Program for Advanced Study in Business Administration

The Program for Advanced Study in Business Administration has been instituted through the Graduate School of Business Administration. The main objective is to provide advanced work in business administration to meet the needs of a rapidly changing environment. Anyone who holds an M.B.A. or its equivalent is eligible. For further information contact the office of the Graduate School of Business Administration.



description of courses

39.805 Business Cycles and Forecasting

Analysis of positive and negative characteristics of modern capitalism followed by a presentation of short- and long-run problems of economic and financial instability. Dynamic models of economic fluctuations, development of economic indicators, and survey data are used to understand the problem of forecasting. An evaluation of conceivable stabilization policies and programs is included. *Prep. 15 Q.H. Grad. Credit.*

39.823 Government Finance

A survey of governmental expenditure, revenue, and debt systems, with emphasis upon their economic effects and their relationship to principles of economic welfare. Discussions of taxation, tax incidence, tax theory, debt management, and employment levels. *Prep. 15 Q.H. of Grad. Credit.*

39.825 Fiscal Policy

Development of a conceptual framework to assess the impact of government policies on attaining full employment, price stability, economic growth, and other economic goals of the public sector. Special emphasis is given to conflicts resulting from simultaneously trying to achieve all goals while combating the problems of inflation and stagnation. *Prep. 15 Q.H. of Grad. Credit.*

39.827 Economic Development

The study of the process of structural change in the course of economic development, with emphasis on the causes and consequences of growth. Models depicting the mobilization and allocation of resources are presented, along with an examination of the cultural and political obstacles to production and distribution in underdeveloped countries today. The theoretical analysis is supplemented with case studies. *Prep. 15 Q.H. of Grad. Credit.*

39.829 Comparative Economic Systems

A comparative study of central economic theories and institutions of Capitalism, Socialism, Communism, and the Welfare State. Particular attention to criteria for evaluating success in meeting diverse goals, techniques and problems of planning, and real growth rates. *Prep. 15 Q.H. of Grad. Credit.*

39.831 Money and Banking

A study of the nature and function of the monetary and banking systems of the United States and of alternative theoretical models of the relationships between money and economic activity. Current issues in monetary theory and policy and international finance are considered. *Prep. 15 Q.H. of Grad. Credit.*

39.833 International Economics

Four areas, history, theory, policy and doctrine, are considered in relating the United States to the rest of the world, with emphasis on theory and policy. A study of money, gold- and/or paper-currency, in international trade and capital movements and the balance of payments are combined with evaluated proposals for international mone-

tary system reforms and other trade agreements recommending more cooperation and integration. *Prep. 15 Q.H. of Grad. Credit.*

39.835 Labor Economics

The economics of wage determination, impact of unions on wages and inflation, the economics of full employment and unemployment, and private and public remedial policies; the labor force, governmental labor legislation, security, unionism, and democracy. *Prep. 15 Q.H. of Grad. Credit.*

41.811 Financial and Managerial Accounting

An introduction to accounting systems, including the development of financial statements. Includes a critical appraisal of analytical techniques of evaluating the firm's potential through historical data. *Prep. none.*

41.812 Control I

After examining the role which profit maximization plays as an entity objective, alternative courses of action for goal achievement are integrated into a programmed budgeting process. Emphasis is given to the budget as a planning, motivating, coordinating, evaluating, and re-planning device. *Prep. 41.811.*

41.813 Control II

A study of the integration and coordination of short-range programs with long-range plans and the control mechanisms which enhance appropriate conformance with the strategic budget. Primary emphasis is on organizations decentralized into divisional units. *Prep. 41.812.*

41.815 Management Control Systems

Management control is the process by which management translates the organizational objectives and strategy into specified goals for attainment in a specified period of time, and secures the effective accomplishment of these goals in an efficient manner. This course deals with systems that facilitate this process, with particular attention to those designed for use at divisional and top management levels. *Prep. 41.813.*

41.816 Management Control of Health Service Systems

The objective of this course is to develop a competence in conceptualizing and managing the planning and control requirements of organizations operating in the health services domain. Major topics include: planning, budgeting, responsibility accounting, cost analysis, and cost control. The role of the controller in these activities is also examined. The course embodies the idea of a system's integrating these requirements. *Prep. 15 Q.H. of Grad. Credit.*

41.825 Management Performance Appraisal

A critical examination of traditional management appraisal, as well as recently proposed techniques. External appraisal of aggregate management performance and internal appraisal of individual management performance are covered. *Prep. 41.812.*

41.862 Tax Factors in Business Decisions

A survey of the Internal Revenue Code and its implications for choice of organizational form, corporate reorganizations, compensation policies, and foreign business operations. Mergers and acquisitions and the management of depreciable property are

examined in the light of decisions made by the Internal Revenue Service and the tax courts. The emphasis is on discussion and research into corporate income tax problems that affect business decisions. *Prep. 15 Q.H. of Grad. Credit.*

43.811 Marketing Management I

The objectives of Marketing Management I and II are twofold: 1. to provide the student with a comprehensive understanding of basic marketing functions, institutions, and concepts; and 2. to develop the student's ability to analyze and make recommendations about business problems that involve the creation, distribution, and sale of goods and services. Marketing Management I emphasizes the definition of marketing problems, demand analysis, consumer analysis, and market research. *Prep. none.*

43.812 Marketing Management II

A continuation of Marketing Management I, with emphasis on the formulation and implementation of marketing strategy. Emphasis is placed on product policy, channels of distribution, pricing, advertising, personal selling, and the development of integrated marketing programs of action. *Prep. 43.811.*

43.814 Consumer Behavior

Development of an understanding of consumer attitudes and behavior processes. Various economic and behavioral models of consumer behavior are examined and evaluated as bases for the planning and evaluation of marketing strategies. Text, readings, project. *Prep. 43.811.*

43.910 International Marketing

Objective is to develop an understanding of: 1. the opportunities and challenges facing the international marketing executive; 2. the decision-making process in marketing goods abroad; and 3. the environmental forces—economic, cultural and political—affecting the marketing process and acting as constraints on the development of marketing strategies abroad. Lectures, discussions, reports, and cases. *Prep. 43.811.*

43.925 Sales Management

Designed to help the student develop both the understanding and decision-making skills necessary to build and maintain an effective sales organization. Cases and readings are used which examine the strategic and operating problems of the sales manager. Four major topic areas are: 1. the selling function, 2. sales management at the field level, 3. the sales executive, and 4. sales and marketing management. *Prep. 43.812, or permission of the instructor.*

43.926 Advertising Management

An overview of management's role in the creation, administration and evaluation of advertising. Readings, discussions, and cases develop knowledge of the four fundamental steps in advertising management and strategy — markets, media, messages, measurement — in marketing consumer and industrial goods and services, and in communications. Topics covered include the role of promotion and communication within the marketing mix, market identification and media strategy, development of advertising messages, program evaluation, the advertiser-agency relationship, and advertising and social issues. *Prep. 43.812 or permission of the instructor.*

43.931 Marketing Research

Major methods and techniques of marketing research are examined to understand the function of research in marketing decision making. Specific topics include research design, determination of information requirements, data collection methods, experimentation, sampling, data analysis, and use of the canned program. *Prep. 43.811 and 49.902.*

43.934 New Product Development

The importance of new products to the survival and prosperity of firms continues to grow with increasing shortening of product life cycles; with changes in technology, competition, and consumer tastes; and with increasing operating costs. For most firms, coping with the problems of environmental change through modification of the product line is both vital and difficult. This seminar will have as a primary concern the examination and analysis of some of the problems firms face in directing and managing their new product development activities. *Prep. 43.812, Marketing Management II.*

43.936 Retail Management

Examines selected major strategy problems facing large-scale food and general merchandise distributors; selects store locations; determines merchandising and promotional policies; and formulates long-range plans. Cases and issues are explored from the viewpoint of the management of prominent supermarket, department store, and discount retailers, with some attention to wholesalers. Designed primarily for students interested in retailing or wholesaling, and those concerned about mass distribution in marketing consumer goods. *Prep. 43.812.*

43.937 Marketing Public Goods and Services

Examines public/private institutional systems involved in providing public goods and services (e.g., health care, housing, education, transportation, defense-aerospace-oceanographic, pollution control, law enforcement) from the standpoint of business markets and participation. Emphasis on the relevant marketing (buyer-seller) and non-marketing relationships between firms and other institutions involved in policy making, service provision, and procurement. *Prep. 15 Q.H. or permission of the instructor.*

43.941 Industrial Marketing

The problems of industrial concerns in marketing their products and services to industrial, business, and organizational customers. Emphasis is placed on determining these customers' needs and on developing programs to satisfy these needs. Topics include the roles and responsibilities of the marketing executive engaged in industrial distribution, advertising, and research, as well as roles and responsibilities of industrial salesmen, sales supervisors, and selling agents. *Prep. 43.812.*

44.811 Financial Management I

This course and its required sequel, 44.812, acquaint students with concepts, practices, and procedures of financial management and offer training in analytical approaches which help them make wise decisions affecting the flow of funds within an organization. Instruction is primarily through readings and cases. *Prep. 41.813.*

44.812 Financial Management II

Concentrates on long-term sources and uses of funds, with an introduction to capital budgeting techniques and the concept of cost of capital. Risk and return trade-offs

are included. Broad topics of overall financial strategy and timing are examined. Frequently, evening students are required to prepare a term report based upon data gathered on their jobs and/or from financial literature. *Prep. 44.811.*

44.814 International Financial Management

Comprehensive coverage of the field of international financial management, including the fundamental problems of financial forecasting, multinational capital budgeting, affiliate financial structures, international fund movements and instruments of international finance, import-export financing, and the characteristics of foreign environments. Background information is sought in the interpretation of U.S. foreign investment controls and the reaction of foreign governments to U.S. interference. *Prep. 44.812.*

44.816 The Management of Financial Resources

Conceptually, decisions regarding the sources and uses of long term funds should be made simultaneously. This course examines both aspects of the decision. A thorough analysis of capital budgeting techniques are combined with an assessment of factors affecting a firm's capital structure. Company assets and how they should be financed are the central questions. *Prep. 44.812.*

44.818 Working Capital Management

The current assets and liabilities sections of an organization's balance sheet determine the amount of long term capital committed to working capital uses. This course examines strategies and analytical approaches for making wise decisions affecting these amounts. Material on money market conditions is included. *Prep. 44.812.*

44.901 Finance III—Advanced Financial Management

An opportunity to study several important areas of financial management in greater depth than is possible in the basic finance courses. Some of the topics are: corporate capital structure, dividend policy, capital budgeting, and the management of current assets. Instruction is primarily through assigned readings and classroom case discussions. *Prep. 44.812.*

44.921 Investment Analysis

Investment principles and risks. The objective is the development of a sound investment program, with attention to identification of investment objectives and risks. Emphasis is placed on the techniques of analysis and evaluation of various types of securities and the associated risks, the operation of the securities markets, and the various methods of portfolio management. *Prep. 15 Q.H. of Grad. Credit.*

44.924 Mergers and Acquisitions

This seminar explores the economic environment which has recently given rise to a large number of corporate mergers and the business factors underlying these corporate combinations. The financial, managerial, accounting, and legal factors affecting mergers are studied. Students learn how to appraise a potential merger and structure a merger on advantageous terms. Instruction is through directed readings, case discussions, and independent research. *Prep. 44.812.*

44.935 Management of Financial Institutions

The intent is to acquaint students with the broad range of decision-making problems faced by major financial institutions such as commercial banks, savings and investment institutions, and finance companies when viewed as competitive, profit-seeking

business entities. Major areas of concern in the course are: sources and uses of funds by financial institutions, competition, regulation, and strategic policy planning by financial institutions. Instruction is primarily through readings and cases. *Prep. 44.812.*

45.805 - 45.806 Operations Management I & II

The primary objective is to develop understanding of management in the operations system—its design operation, control, evaluation, and modification. Two second objectives: (1) to increase capability for managerial decision making in technical matters; and (2) to develop an appreciation of the operations manager's job. Topics include: design of product, design of process, human factors engineering, development of capacity, line balancing, man-machines systems, work measurement, job evaluation, wage payments system, project network models, production planning, inventory management, production scheduling and control, and management of product quality and statistical quality control. Operations Management I concentrates on the design of the operations system; whereas Operations Management II focuses on the operation and control. Prep. Basic courses in accounting and control, finance, quantitative analysis, and organizational behavior or permission of the instructor. *Prep. 45.805 for 45.806.*

45.808 Comparative Management

An analysis of the management process in different types of organizations with emphasis on similarities. Among the types of organizations examined are: business firms, school systems, colleges and universities, unions, political parties, prisons, hospitals, churches, and military organizations. *Prep. 15 Q.H. of Grad. Credit.*

45.809 Advanced Operations Management

This course is designed for those whose career goals are positions of responsibility in the management of the manufacturing or operations function of an enterprise. Although the primary focus is upon manufacturing enterprises, complex operating problems in service-oriented institutions are included. Drawing primarily upon case studies, the course focuses on the development and implementation of detailed responses to the management requirements of operating systems. Emphasis is given to emerging technological developments, such as computer-based mechanization and automation, and to new developments in several areas of production and operations management. *Prep. 45.806.*

45.810 Operations Management in the Service Sector

Since the concepts and techniques of Operations Management were first developed in manufacturing settings, traditional courses in operations management have dealt with manufacturing. These concepts and techniques have wide applicability in service and non-profit sectors which need the tools and techniques already used in manufacturing. Concentration is on application of concepts and techniques in the service sector. Industries include: restaurant, health-care, recreation, brokerage, insurance, and airline. *Prep. 45.805 or permission of the instructor.*

45.811 Purchasing and Materials Management

Specialized managerial skills are related to purchasing and other materials management activities. Although primarily industrial, the same principles are applied to non-profit, non-manufacturing organizations. Instructor uses both text and cases, as well as extensive personal experience. *Prep. 15 Q.H. of Grad. Credit.*

45.815 Behavioral Concepts

A brief examination of major concepts and findings of the behavioral sciences which have particular pertinence to business and administration. Systematic ways of understanding behavior are developed, taking account of technical, economic, political, and human factors. Individual development is studied from the standpoint of character, perception, learning, and motivation. Behavior of people in small groups is also examined in terms of the structure and dynamics of the individuals in the group. *Prep. none.*

45.816 Organizational Behavior I

Basic findings and concepts of the behavioral sciences are related to the specific aspects of behavior in formally constituted organizations. Supervisory behavior is examined in the behavioral context, as well as relations between groups, in order to develop ways of achieving collaboration. *Prep. 45.815.*

45.817 Organizational Behavior II

The study of behavior in organizations is expanded to larger organizations in order to understand and deal systematically with the complex relationships found at this level. This course also provides an opportunity to apply knowledge about people in organizations to the improvement of organizational systems and to the process of achieving changes in organizations. *Prep. 45.816.*

45.819 Interpersonal Behavior

An intensive inquiry into communications from one person to another, the longest distance of all. Makes use of unconventional media for learning (selected films, drama, and the short story) in which universal qualities of the interactions between people are described, analyzed, and reinterpreted to different settings in today's world. *Prep. none.*

45.820 Psychological Dynamics of Leadership

Reviews the existing approaches and hypotheses about the nature of leadership. Focuses on psychoanalytic theory as a foundation from which to understand leadership behavior. An extensive case history provides material for class discussion and illustration of the theories of leadership. *Prep. 15 Q.H. of Grad. Credit.*

45.821 Policy Formulation in Nonbusiness Institutions

This seminar focuses primarily on the decision-making process in government institutions, primarily at the Federal level. Readings portray nonrational perspectives on behavior, such as the cybernetic and political models of decisions. Their larger aim is to develop awareness of cognitive limitations of public policy decision-makers and the inherent dysfunctions of bureaucracies in which they operate. Class sessions explore the evolution of public policy, the role of analysis in policy formulation and implementation, and the methodology of policy analysis. The seminar is concerned with strategic decisions rather than with day-to-day operating problems. *Prep. 15 Q.H. of Grad. Credit.*

45.823 Career Planning and Development

Effective career planning and development is best viewed through the larger context of an individual's actualization process in life. Career evaluation considers personal values, interests, aspirations, sense of self-worth and managerial skills; and on the other hand, the realities of specific occupational and professional choices. Each

participant will generate and analyze a wide variety of data to provide better insight into his goals, interests, and managerial skills. Greater career fulfillment is the objective. *Prep. 45.816.*

45.824 Organization Behavior in Nonprofit Environment

Human services organizations involved in health care, welfare, and education are studied in reference to recent behavioral theories and concepts dealing with the internal and external complexities and inter-relationships of large-scale organizations. Term projects are designed to conduct and analyze a problem situation and develop plans for implementing change. Readings, cases, and seminars. *Prep. 45.815, 45.816.*

45.828 Seminar in Growth Strategies for Corporate Management

An opportunity for in-depth research and analysis of growth strategies available to business firms. In a seminar setting, students examine firm and industry approaches to growth through expansion and diversification. Special emphasis is placed on the use of research and acquisition as means for achieving growth objectives. *Prep. 45.825, and permission of the instructor.*

45.829 New Ventures: A Career Choice

This course enables students to examine the nature of entrepreneurship and the appropriateness of self-employment for an individual. The focus is on the decision to own and operate one's own business. Students examine the nature of the values, motivations, goals, and life style required by the entrepreneurial role. Guest speakers, cases, selected readings, and self-assessment exercises help students identify the congruency between their own interests and goals and an entrepreneurial career. The course also offers potential value for prospective loan officers, investment bankers and venture capitalists, CPAs, management consultants and others whose career activities may involve them with entrepreneurs and managers of new ventures or smaller companies. *Prep. 15 Q.H. of Grad. Credit, or permission of instructor.*

45.830 Formal Planning Systems

Although plans that extend five or more years into the future are no longer a novelty, the formal planning concept itself is still in its infancy. This course focuses on the present-day "state-of-the-art" in planning for both profit and nonprofit organizations of various sizes. Students are expected to develop hypothetical plans based upon their own assessment of economic and other environmental factors. *Prep. 15 Q.H. of Grad. Credit.*

45.833 Operations Management in the Health Care System

This course serves those whose career goals are positions of responsibility in the management of the health care system. The objectives of the course are: 1. to provide a basic understanding of operations management problems existing in the health care system, and 2. to develop decision-making ability to deal effectively with these problems. Topics covered in the course are: the fundamentals of management in the health care system, organizational planning, operations planning and control, utilization of resources, and policy considerations in effective and efficient operation of the health care system. *Prep. 45.805 and 45.806, or permission of instructor.*

45.835 Seminar In Organizational Development

Organizational development is the process of deliberate organizational change that is planned, organization-wide, and managed from the top so as to increase organiza-

tional effectiveness through planned intervention by change agents. This course examines organizational development as an emerging professional discipline, focusing on identifying variables affected by a change program and developing an understanding of methods and techniques. *Prep. 45.817*

45.836 Policy: The Social, Political, Economic, and Legal Environment

Both business and nonbusiness organizations exist in a multifaceted environment of social, political, economic, and legal entities whose influences must be identified and dealt with by a responsive decision-making process. The concept of corporate strategy is developed as a medium in which to achieve these objectives. *Prep. all other required courses.*

45.837 Policy: The Formulation and Implementation of Strategy

A continuation of course # 45.836, with emphasis on the formulation and implementation of organizational strategy. Approaches to strategy formulation and implementation in both profit and nonprofit organizations are compared and contrasted. Topics include: organizational structure and behavior, long-range planning, control and motivation systems, information systems, and leadership. All topics are considered within the systems framework of organizational strategy. *Prep. 45.836.*

45.838 Policy Formation in Health Care

A focus on the problem of defining and implementing policy in the health care sector. The various internal and external components of the health care system are analyzed as they relate to policy making and implementation. The course also includes a discussion of nontraditional methods of health care delivery such as neighborhood health care centers and national health insurance. *Prep. 15 Q.H. of Grad. Credit.*

45.839 Women Managers

A systems approach to an emerging type of manager—the woman. An examination in historical perspective of women in the labor force with attention to the changing socio-economic, technological, and legal environments of the business and service community. Problems encountered for businesses and individual men and women, as well as possible changes. Cases, readings, films and an individual project review. *Prep. 15 Q.H. or by permission of the instructor.*

45.841 Public/Private Service Systems

Examines public/private institutional systems involved in providing public goods and services e.g., health care, housing, education, transportation, defense-aerospace-oceanographic, pollution control, law enforcement. The perspective involves the roles of various participants, and the alternative strategies appropriate for particular participants. *Prep. 15 Q.H. or permission of the instructor.*

45.902 Planning and Control of Manufacturing Operations

A study of the problems of managing the flow of materials, operations, and information within an organization in response to, or anticipation of, market demands. The concepts and techniques discussed are applicable in a variety of institutional settings. Topics include: inventory management, demand forecasting, manpower and operations scheduling, project management, and integrated operations control systems. The tone of the course is pragmatic; particular emphasis is on practical evaluation and problems of implementing the analytic methods discussed. *Prep. 45.806 or permission of the instructor.*

45.951 Executive Development

An examination of the executive position in an organization and the personal characteristics and skills which it requires. The course examines the effects of cultural change and shifting mores on motivation and management control, with their implication for developing appropriate organizational relationships. Report writing, oral reports, and leading of group discussions are dominant techniques. Student evaluation is encouraged. *Prep. 15 Q.H. of Grad. Credit.*

45.962 Institutional Environment of Business I

The relationship of the business corporation to various elements in its environment: political, social, economic, scientific, and educational. Developing interactions and mutual responsibilities, with emphasis on initiating and planning, to influence these external institutional relations rather than only to respond to them. Responsibilities of business and of businessmen for community, national, international, and ecological welfare. *Prep. 15 Q.H. of Grad. Credit.*

45.964 Institutional Environment of Business II

Further examination of the relation of business to its environment and the responsibility of the businessman and the firm to external and internal interests in a dynamic and pluralistic system. Emphasis on situations involving conflicting values and personal, organizational, moral, and public interest, with role playing to allow student participation in corporate conflict determination. *Prep. 45.962.*

45.965 Management of Small Business Enterprises

Problems in various beginning stages of management of new small enterprises. Case studies develop analytical approaches for appraising the risks and rewards of potential growth opportunities, as well as operating problems. Problems range from locating, evaluating and financing a small company, to the survival and growth of an established business. Guest speakers relate pertinent business experiences to in-class activities. *Prep. 15 Q.H. of Grad. Credit.*

45.968 Management of New Enterprises

Oriented toward the entrepreneur. Consideration given to locating and evaluating business opportunities introduced by new ideas, product development, licensing, inventions, patents, etc. The organization, start, and growth of a new business or the acquisition of a going concern, including fund raising and related state regulations. *Prep. 15 Q.H. of Grad. Credit.*

45.969 Government and Business

Analysis of the role of government as a regulating force, as well as the nature and impact of government fiscal, economic, and socio-economic policies on the conduct of business. The political and economic philosophies behind greater government participation in the economic structure of the nation as indicated by public-utility, antitrust, labor, and socioeconomic legislation. *Prep. 15 Q.H. of Grad. Credit.*

45.971 Personnel Management

Significant developments of labor relations and employment theory; the principles of personnel management and of management-union relations; policy considerations for the managing of manpower resources; policy impact of current developments in work theory; and resource management. *Prep. 15 Q.H. of Grad. Credit.*

45.972 Labor Relations

Traditional labor policy in relation to management, unions, and the public; management-union relations as joint control over human resources of private and public organizations; history of the labor movement and collective bargaining; work rules and productivity; labor disputes and supplements to negotiations; political and economic power; legal responsibilities of labor and management; management authority and employee discipline; and types of management-union relations.

Prep. 45.971.

45.973 New Sectors of Collective Bargaining

A focus on new sectors of bargaining: 1. by public employees, including municipal, state, and Federal; 2. by professional associations, including those of teachers, doctors, nurses, and engineers; and in the mainly unorganized sectors; i.e., agriculture, health care industry, and so-called white-collar-service areas. The purpose is to study the variety of patterns emerging in these sectors as a result of the interplay of the following forces: 1. presence or absence of a national labor law or policy; 2. relationship to existing trade union structure and industrial relations system; 3. occupational characteristics and industry or service technology, and 4. productivity and growth. Varying issues in collective bargaining are discussed through cases, readings, and a group term project, and by invited practitioners. Prep. 15 Q.H. of Grad. Credit.

45.975 Introduction to Health Care Systems

Health care systems from the administrator's point of view. Subjects include environmental factors, strategic planning, identification and implementation of objectives, and allocation of resources. A seminar format utilizes both text and cases; students are also expected to prepare a research paper which identifies a health care administration problem and proposes a solution. Prep. 15 Q.H. of Grad. Credit.

45.976 Workers in the Health Care System

The present health care system in the United States is in the process of major change generated by both the internal and external social, legal, and professional environments. The purpose of this course is to describe and analyze some of the dynamics and complexities of these changes and to consider how these changes affect the workers in the system. In turn, the worker's influence on these changes is studied. The foci are the past, present, and future of major occupation levels and groupings servicing the system, their relationship to each other and to the total system. A major feature of the course is a group research project. Case studies, readings, lectures, and guest speakers are also used. Prep. 45.815, 45.816.

45.977 Information Systems for Health Care Facilities

Introduction to the complexities of the quantity and variety of information requirements in the field and the state of the technology capability, as well as an understanding of the system's components through use of this information. Course covers systems information flow and new computer techniques. Cases, readings, and on-site visits. Prep. 15 Q.H. of Grad. Credit.

45.985 Management of Research and Development

Some corporations grow more rapidly than their competitors because of better management of their technical programs. This course focuses on the unique problems of R & D management through readings and case studies of the important consider-

ations involved in dealing with scientists and engineers as individuals; planning, organizing, and controlling research; and establishing a climate for research. *Prep. 41.811 and 45.817.*

45.989 Science and Technology: The Challenge to Management

Greater understanding of the growing importance of the results of science and technology on business activity and of the special problems and opportunities encountered by management in using this knowledge. The course examines the complex interaction of social, economic, political, and technical variables affecting the climate for technological change. The critical role of the manager in the innovative process is studied, examining the great array of techniques which help him keep abreast of new R & D results. The contribution of various organizational structures to the creative application of technology is also examined. *Prep. 15 Q.H. of Grad. Credit.*

45.991 Business Law—Law of Contracts, Agency, and Sales

Designed to give the student a basic knowledge of the legal aspects of contracts and the results of contractual obligations. Attention is paid to the employment contract in general, with emphasis on the principal and agent, and the master and servant relationships. The law governing the sale of personal property as reflected in the Uniform Commercial Code is incorporated. *Prep. 15 Q.H. of Grad. Credit.*

45.992 The Law of Business Organizations and Negotiable Instruments

The Law of Negotiable Instruments as reflected in the Uniform Commercial Code, with special consideration given to commercial paper used in business transactions. The law governing formation and operation of partnerships, corporations, and other business organizations, with emphasis on the legal results and operations of those concerned with the liability of members thereof. A study of the legal framework within which the formal business organization must operate. *Prep. 45.991 and 15 Q.H. of Grad. Credit.*

45.993 Labor Law

An overview of constitutional and legal problems involved in labor organizing, industrial relations, labor negotiations, labor contract enforcement, and dispute resolution in both private and public sectors of labor administration. Cases are studied for the legal principles underlying common law, state and federal laws, and constitutional questions of power and authority. *Prep. 15 Q.H. Grad. Credit.*

45.997 Special Studies in Business Administration (1 to 3 Q.H. Credit)

A special tutorial arrangement between a student and a faculty member for a guided reading, research, laboratory, fieldwork, report, or teaching experience. It is for graduate students who desire to do advanced work or carry out some special investigation of a problem in business administration not specifically covered elsewhere in the curriculum. Students must petition the Committee on Graduate Study in Business Administration for permission to register in this course. This petition should include an outline, a brief description of the work planned, and an indicator of the professor to whom the student will be responsible. The professor will submit to the Graduate Office a letter outlining in some detail the nature of the work that the student will be doing in the course. The petition will be submitted after the student has received permission to take the course from a member of the College of Business Administration faculty. The course carries variable credit, ranging from one to three quarter hours. *Prep. 15 Q.H. of Grad. Credit.*

5.998 Special Studies in Business Administration (3 Q.H. Credit)

See 45.997 for course description.

5.999 Special Studies in Business Administration (3 Q.H. Credit)

See 45.997 for course description.

8.801 Seminar in Transportation

The objectives are twofold: 1. to provide a basic understanding of the functions and importance of the domestic transportation system, and 2. to develop the student's ability to analyze government policies related to transportation. The cost, service, and pricing characteristics of the several modes of transportation are examined. Emphasis is given to the special problems which confront both carriers engaged in the various forms of transportation and shippers who rely upon their services. *Prep. 15 Q.H. of Grad. Credit.*

8.901 Physical Distribution Management

Study of the design and management of physical distribution systems to facilitate the flow of goods through distribution channels. It covers aspects of plant and warehouse locations, inventory controls, and selection of transportation carrier. The course includes the use of case problems in logistics. *Prep. 15 Q.H. of Grad. Credit.*

9.901 Managerial Economic Analysis

Managerial economic analysis establishes the economic foundations and framework for managerial decisions. The course provides an introduction to the principles of economic analysis, economic institutions, and issues of public policy. It stresses the interdependency of the economic decisions of the firm with industry structures and national economic policies. Topics covered include: sources, market decisions and market structure, employment and growth, and the economic role of governmental resource allocations. *Prep. none.*

9.902 Quantitative Analysis I

Decision making takes place in a probabilistic environment. The concept of statistical inference is emphasized, with the objective of generating and understanding the process by which the analyst draws conclusions from a small sample compared to the characteristics of a large data set. The techniques employed in decision making under uncertainty (payoff tables, decision trees) are also discussed. *Prep. None.*

9.903 Quantitative Analysis II

Introduction to the theory and practice of management science and operations research. The topics of regression analysis, linear programming, and simulation are discussed in text and case material; emphasis is on practical application of these techniques. Issues of problem definition, model building, relevant cost determination, solution generation, and implementation of results are considered. *Prep. 49.902.*

9.907 Operations Management Game

The Operations Management Game is a computer game of considerable complexity focusing on operations problems. Teams are formed to make several decisions affecting the operation of the firm for the next day: i.e., on hiring-firing, overtime, machine sequencing, maintenance, and capital expenditures. These decisions are then submitted to the computer and their consequences are provided as output to each team. The team reacts by preparing another set of entries to guide the firm's operation for the next day. During the game models covered in operations research

and the operations management courses are explored to determine their usefulness as decision aids. *Prep. 49.903, 45.806.*

49.918 Information Theory and Systems

The objective of this course is to develop a framework for the analysis of communication and information systems in organizations. Aspects of communications theory are studied as background for building this framework and its underlying theory is tested. Topics include development of an analytical framework for viewing information systems and communication in organizations. Various aspects of communications theory are discussed and analyzed. A major objective of the communications and informations flow in organizations is to tie these events back to the underlying theory. *Prep. 15 Q.H. of Grad. Credit.*

49.932 Introduction to Computer Applications

A business-oriented introduction to data processing functions and systems. Introduction to the history, terminology, technology, and economics of data processing hardware and software. Management issues in the design, selection, evaluation, and use of computers and computer services. Individual familiarization with elementary computer programming by using either batch or time-shared computer facilities to solve simple business-oriented exercises. When feasible, a visit to a data processing center is conducted. *Prep. 15 Q.H. of Grad. Credit or permission of the instructor.*

49.933 The Computer and Its Applications II

The Management Information System (MIS) concept which stresses how a computer-powered information system can benefit all levels of management is emphasized. The course illustrates the economics of MIS and computers, describing the steps necessary for successful installation and employment of MIS concepts. An extensive case study illustrates systems design, dollar/benefit tradeoffs, and the proper level of management involvement. Familiarization with the systematic or systems approach to analyzing and solving computer and information systems problems as well as general business problems. Business management rather than computer technology is stressed. *Prep. 49.932.*

49.935 Computer Applications in Management Science

Discussion of the technical, economic, and procedural aspects of applying quantitative techniques of management science to planning and operations problems. Heavy emphasis is on the computer's role in this process. Concentration is on selected techniques such as linear programming, simulation, and multiple regression analysis. Practical problems of designing computer programs, selecting canned packages, gathering data, and implementing results are considered. The required term project allows an in-depth study of an area and/or technique of the student's choosing. This project may take a variety of forms: a computer model written by the student, use of a canned package or a model written by others, library research report, formulation of a practical problem for future solution. Ability to program is not required, nor is computer programming emphasized; however, extensive time-sharing and batch-processing computer service is available for those who wish to use it. *Prep. 49.902, 49.903, and 49.932.*

undergraduate universities attended by students

Air Force Academy
Amherst College
Arizona, University of
Assumption College
Bates College
Brantley College
Boston College
Boston University
Bowdoin College
Randolph University
Brooklyn Polytechnic Institute
Brown University
Carnegie University
Alcutta, University of (India)
California, University of
Annis College
Case Institute of Technology
Catholic University of America
Catholic University (Venezuela)
Cincinnati, University of
City College of New York
Colby College
Olgate University
Columbia University
Connecticut, University of
Cornell University
Dartmouth College
Delaware, University of
Denison University
Drake University
Drexel University
Duke University
Fairfield University
Florida, University of
Fordham University
Franklin and Marshall College
Gettysburg College
Jafford University
Harvard University
Hawaii, University of
Iram College
Jabot College
Leofstra University
Holy Cross College
Houston, University of
Illinois, University of
Institute of Science (India)
Ithaca College
Johns Hopkins University
Lafayette College
Lake Forest College
Lehigh University
Lowell Technical Institute
Loyola University (Chicago)
Maine, University of
Maryland, University of
Massachusetts Institute of Technology
Massachusetts Maritime Academy
Massachusetts, University of
McGill University (Canada)
McMaster University (Canada)
Merrimack College
Nebraska, University of
New Hampshire, University of
Northeastern University
Notre Dame, University of
Ohio Wesleyan University
Pennsylvania State University
Pennsylvania, University of
Plymouth State College
Providence College
Radcliffe College
Rensselaer Polytechnic Institute
Rhode Island, University of
Rochester Institute of Technology
Rochester, University of
Rutgers, The State University (New Jersey)
St. Anselm's College
St. John University
St. Lawrence University
Simmons College
Smith College
Stanford University
State College at Boston
State University of New York, at Buffalo
State University of New York, at Genesco
State University of New York, at Oneonta
Stonehill College
Suffolk University
Sydenham College (India)
Syracuse University
Tennessee, University of
Texas, University of
Tufts University
United States Merchant Marine Academy
United States Military Academy
United States Naval Academy
Vermont, University of
Villanova University
Virginia Polytechnic Institute
Wesleyan University
Worcester Polytechnic Institute
Yale University

faculty directory

Name	Room	Extension
Ammer, Dean S.	213 HA	437-3252
Anderson, Harley H.	202 HA	3230
Arnett, Matthew D.	305 HA	3257
Caplan, Robert H.	302 HA	3255
Carter, Clairmont P.	205 HA	3240
Castellano, John J.	213 HA	3252
Cerullo, Saverio	209 HA	3248
Chugh, Lal C.	209 HA	3248
Collazzo, Charles J.	322 HA	3260
Croke, Paul V.	305 HA	3257
Crotty, Philip T.	202 HA	3230
Curran, Joseph R.	213 HA	3252
Dufton, Charles H.	322 HA	3260
Farrar, Robert H.	205 HA	3240
Fetters, Michael	205 HA	3240
Fiumara, Angelo	204 HA	3236
Godin, Victor B.	204 HA	3236
Graetz, Herbert	305 HA	3257
Gubellini, Carlo E.	206 HA	3244
Hehre, Robert J.	222 HA	3248
Hekimian, James S.	202 HA	3230
Higgins, Richard B.	304 HA	3255
Hobart, Christine L.	213 HA	3252
Janell, Paul	205 HA	3240
Jordan, John W.	224 HA	2714
Keith, Lyman A.	204 HA	3236
Kinnunen, Raymond A.	302 HA	3255
Lieb, Robert	204 HA	3236
Lindhe, Richard	205 HA	3240
Malchman, Lawrence	114 HA	2167
Marple, Wesley W.	209 HA	3248
Marshall, Edward	213 HA	3252
McCarthy, Daniel J.	302 HA	3255
McDonald, Philip R.	322 HA	3260
Minichiello, Robert J.	322 HA	3260
Moriarty, Mark M.	322 HA	3260
Nielson, Richard	322 HA	3260
Olive, Russell W.	302 HA	3255
Parsons, Robert A.	302 HA	3255
Priem, Andre P.	305 HA	3257
Richards, Paul C.	205 HA	3240
Rochwarg, Herman	305 HA	3257
Rugina, Anghel N.	209 HA	3248
Santos, Richard J.	212 HA	3272
Scioletti, Daniel C.	204 HA	3236
Shelley, Charles	204 HA	3236
Slavin, Albert	205 HA	3240
Stephenson, Frederick J.	204 HA	3236
Timmons, Jeffry	213 HA	3252
Ward, Raymond	209 HA	3248
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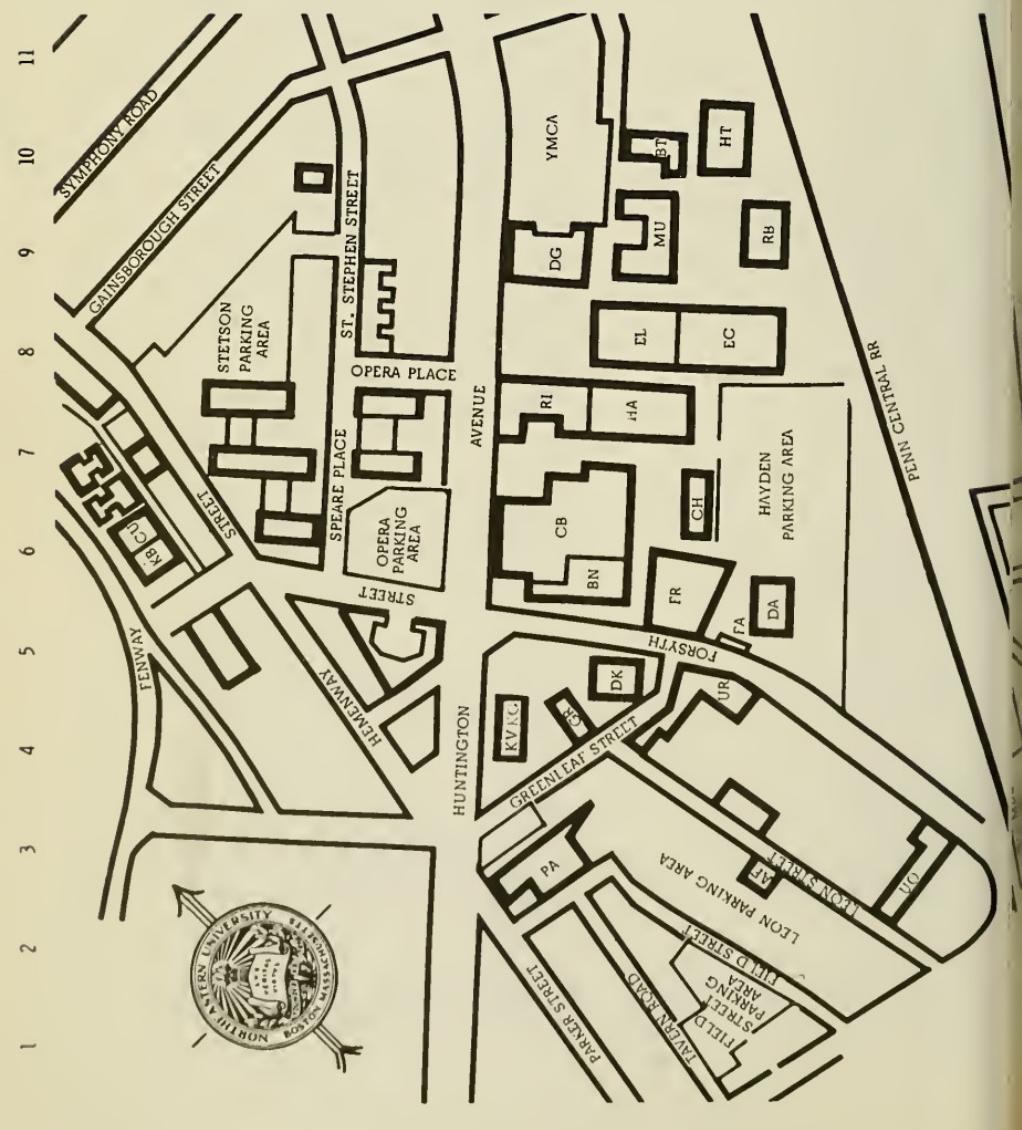
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<u>Building Designation</u>	<u>Building</u>	<u>MAP REFERENCE</u>
BN	Bartlett Natatorium	F6
BT	Botolph Building	F10
CB	Cabot Physical Education Ctr.	E6
CH	Churchill Hall	G7
CU	Cushing Hall	A6
DA	Dana Research Center	H6
DK	Dockser Hall	F5
DG	Dodge Library	E9
EC	Elli Student Center and Alumni Auditorium	G8
EL	Forsyth Building	F8
FR	Forsyth Building Annex	66
GR	Greenleaf Building	F4
HA	Hayden Hall	G10
HT	Hurtig Hall	E4
KB	Kennedy Building	B6
KV	Knowles Center (Gryzmish)	J3
KG	11 Leon Street	H3
UO	Afro-American Institute	F9
AF	Mugar Life Sciences Building	F3
MU	Parker Building	E7
PA	Richards Hall	H9
RI	Robinson Hall	65
RB	United Realty Building	





northeastern university bulletin



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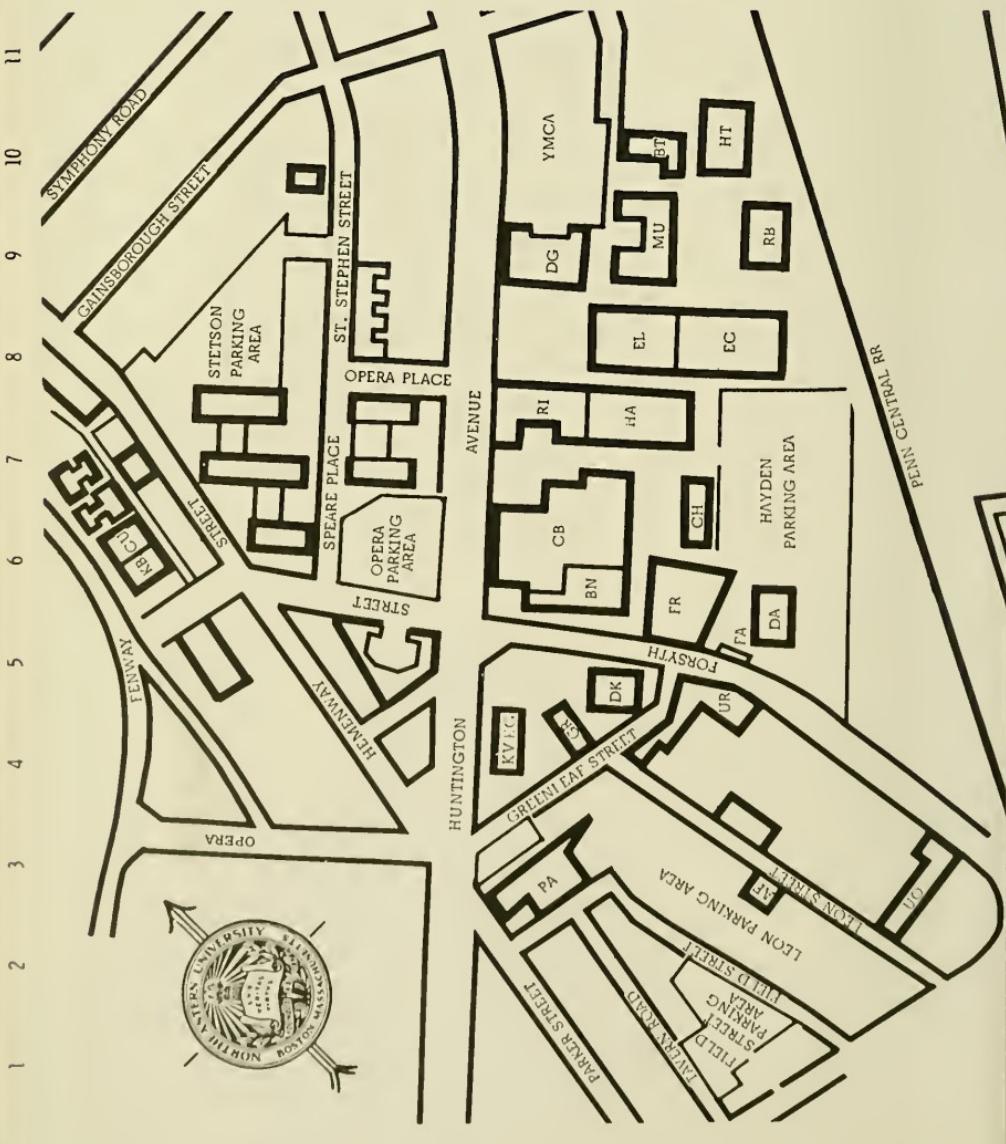
NORTHEASTERN UNIVERSITY



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<u>Building</u>	<u>Building Reference</u>	<u>Designation</u>
F6	Barletta Natatorium	BN
F10	Botolph Building	BT
E6	Cabot Physical Education Ctr.	CB
G7	Churchill Hall	CH
A6	Cushing Hall	CU
H6	Dana Research Center	DA
F5	Dockser Hall	DK
E9	Dodge Library	DG
G8	Elli Student Center and Alumni Auditorium	EC
F8	Forsyth Auditorium	EL
66	Forsyth Building	FR
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F9	Mugar Life Sciences Building	MU
F3	Parker Building	PA
E7	Richards Hall	RI
H9	Robinson Hall	RB
G5	United Realty Building	UR



ACADEMIC CALENDAR 1974-1975

Fall Quarter 1974

Registration period (1:00-3:00 and 5:30-8:00 p.m.)		
Boston	Monday-Thursday	Sept. 23-Sept. 26
Classes begin	Monday	September 30
Thesis committee approval forms due (full-time students)	Friday	November 15
Last day to drop a course	Wednesday	November 27
Examination period†	Monday-Friday	Dec. 16-Dec. 20

Winter Quarter 1974-1975

Registration period (1:00-3:00 and 5:30-8:00 p.m.)		
Boston	Monday-Thursday	Dec. 9-Dec. 12
Approved thesis proposals due (full-time students)	Monday	December 16
Classes begin	Monday	January 6
Last day to drop a course	Saturday	March 8
Examination period†	Monday-Friday	Mar. 24-Mar. 28

Spring Quarter 1975

Registration period (1:00-3:00 and 5:30-8:00 p.m.)		
Boston	Monday-Thursday	Mar. 17-Mar. 20
Classes begin	Monday	April 7
Last day to drop a course	Saturday	June 7
Examination period†	Monday-Friday	June 16-June 20

Summer Quarter 1975

Registration period (1:00-3:00 and 5:30-8:00 p.m.)		
Boston	Wednesday-Thursday	June 18-June 19
Classes begin	Monday	June 30
Last day to file commencement card for fall commencement	Friday	August 1
Thesis due (full-time students)	Monday	August 11
Last day to pay fee for fall commencement	Friday	August 29
Fall commencement	Thursday	Sept. 11

[†]Examinations for day classes will be held in accordance with the undergraduate examination schedule.

UNIVERSITY HOLIDAYS 1974-1975

Columbus Day	Monday	October 14
Veterans' Day	Monday	October 28
Thanksgiving Recess	Thursday-Saturday	Nov. 28-Nov. 30
Christmas Vacation	Monday-Friday	Dec. 23-Jan. 3
Washington's Birthday	Monday	February 18
Patriots' Day	Monday	April 15
Memorial Day	Monday	May 27
Independence Day	Thursday	July 4
Labor Day	Monday	September 2

Equal Opportunity Policy

Northeastern University is committed to a policy of providing equal opportunity for all. In all matters involving admission, registration, and all official relationships with students, including evaluation of academic performance, the University insists on a policy of nondiscrimination. Northeastern University is also an equal opportunity employer; it is institutional policy that there shall not be any discrimination against any employee or applicant for employment because of race, color, religion, sex, age or national origin. In addition, Northeastern takes affirmative action in the recruitment of students and employees.

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Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under the General Laws of Massachusetts. The State Legislature by special enactment has given the University general degree-granting powers. The University is governed by a Board of Trustees elected by and from the Northeastern University Corporation, which is composed of 170 distinguished business and professional men and women.

From its beginning, Northeastern University has had as its dominant purpose the discovery of community educational needs and the meeting of these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Cooperative Plan, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922), Liberal Arts (1935), Education (1953), Pharmacy (1962), Nursing (1964), Boston-Bouvé College (1964); the College of Criminal Justice (1967); and by Lincoln College's daytime Bachelor of Engineering Technology program (1971). This educational method enables students to gain valuable practical experience as an integral part of their college program and also provides the means by which they may contribute substantially to the financing of their education. The Plan has been extended to the graduate level in engineering, actuarial science, rehabilitation administration, professional accounting, business administration, and law.

In the field of adult education, programs of study have been developed to meet a variety of needs. University College offers evening courses — offered by the University since 1906 — and adult-day courses leading to the bachelor's degree. In addition to offering day undergraduate programs in Electrical Engineering Technology and Mechanical Engineering Technology, Lincoln College offers evening/part-time certificate, associate, and bachelor degree programs in technological areas. All formal courses of study leading to degrees through part-time programs are approved by the Basic College faculties concerned.

GRADUATE AND PROFESSIONAL SCHOOLS

The ten graduate and professional schools of the University offer day and evening programs leading to the degrees listed.

The Graduate School of Actuarial Science offers the degree of Master of Science in Actuarial Science.

The Graduate School of Arts and Sciences offers the degrees of Master of Arts, Master of Science, Master of Science in Health Science, Master of Public Administration, and Doctor of Philosophy.

The Graduate School of Boston-Bouvé College offers the degree of Master of Science.

The Graduate School of Business Administration offers the degree of Master of Business Administration.

The Graduate Program in Criminal Justice offers the degree of Master of Science.

The Graduate School of Education offers the degree of Master of Education and the Certificate of Advanced Graduate Study.

The Graduate School of Engineering offers the degrees of Master of Science, Engineer degree, Doctor of Engineering, and Doctor of Philosophy.

The School of Law offers the degree of Juris Doctor.

The Graduate School of Pharmacy and Allied Health Professions offers the degrees of Master of Science and Doctor of Philosophy.

The Graduate School of Professional Accounting offers the degree of Master of Science in Accounting.

CENTER FOR CONTINUING EDUCATION

The Center for Continuing Education was established in 1960 to relate the University to the needs of its community in a period of accelerated change. Adult education programs offered by the Center and University College have since been consolidated. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. The Division of Special Programs, working cooperatively with trade associations and professional societies, offers a wide variety of programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

RESEARCH ACTIVITIES

The facilities of the University are engaged in a wide variety of basic research projects in business, science, social science, pharmacy, and engineering. These are coordinated by the Dean of

Research, whose services are University-wide and available to the faculties of all the Colleges.

Although Northeastern is primarily concerned with undergraduate and graduate instruction, the University believes that the most effective teaching and learning take place in an environment characterized by research activities directed toward extending the frontiers of knowledge.



buildings and facilities

MAIN CAMPUS

The main campus of Northeastern University is located at 360 Huntington Avenue in the Back Bay section of Boston. Many of the city's famous cultural, educational, and philanthropic institutions are situated in the Back Bay, including the Museum of Fine Arts, Symphony Hall, Horticultural Hall, the Isabella Stewart Gardner Museum, the Harvard teaching hospitals, the Boston Public Library, and many schools and colleges. Most are within walking distance of Northeastern University.

Major transportation facilities serving the Boston area are Logan International Airport, two rail terminals, bus terminals serving inter- and intrastate lines, and MBTA subway-bus service within the metropolitan-suburban area. There is a subway stop in front of the campus. For motorists, the best routes to the campus are the Massachusetts Turnpike (Exit 22) and Route 9, of which Huntington Avenue is the intown section.

The campus of 48 acres is divided by Huntington Avenue, with the main educational buildings on one side and dormitories on the other. The principal buildings, all of which have been constructed since 1938, are of glazed brick in contemporary classic style. Most are interconnected by underground passageways.

Elli Student Center

The Carl S. Elli Student Center provides facilities for student recreation and for extracurricular activities. The Alumni Auditorium, with a seating capacity of 1,300, is part of the Center. Also included are special drama facilities, a ballroom main lounge, fine arts exhibition area, student offices, conference rooms, and a dining area seating more than 1,000.

Libraries

The University library system consists of the Dodge Library, which is the main library; the Suburban Campus Library at Burlington; the School of Law Library; and divisional libraries for Physics and Electrical Engineering, Chemistry and Biology, Mathematics and Psychology, and Health, Physical and Recreation Education, and Physical Therapy. There are additional subject collections for the Center for Management Development at Andover, Massachusetts, and the Marine Science Institute in Nahant.

The library collections number 360,000 volumes supplemented by some 267,000 titles in microprint, microfilm, and microfiche forms. The collection includes, in addition, some 3,500 periodical titles, 90,000 documents, and 4,600 sound recordings.

Cabot Physical Education Center

The Godfrey Lowell Cabot Physical Education Center is one of the best equipped in New England. The large gymnasium contains four basketball courts. In addition, the Center consists of an athletic cage, a small gymnasium, and a rifle range, as well as administrative offices for the Department of Athletics and for the Physical Education Department of Boston-Bouvé College.

A recent addition to the center, the Barletta Natatorium, houses a 105-foot swimming pool, a practice tank for the crew, handball courts, and shower and dressing facilities.

Dockser Hall

Charles and Estelle Dockser Hall, completed in 1968, houses a large gymnasium, dance studio, motor performance laboratory, college library, community recreation laboratory, folk arts center, dark and music rooms, recreation resources area, locker rooms, offices, classrooms, conference room and lounge, storage facilities, and a research laboratory.

Apartments for Graduate Students

The University maintains a 100-apartment housing unit which accommodates 279 people. Two-, three-, and four-party apartments are available which vary in size from two to four rooms plus bath. Apartments are furnished with beds, chairs, desks, stove, refrigerator, and kitchen table. The cost includes all utilities.

A \$50 deposit is required when making application for the apartments. Applications are available in the Office of University Housing. Students are expected to make such arrangements on a term-to-term basis but may live in the apartments both while on cooperative work assignments and in school if they wish. All reservations are made on a first come, first served basis.

SUBURBAN FACILITIES

Suburban Campus

The Suburban Campus, located near the junction of Routes 128 and 3 in Burlington, Massachusetts, was established to meet the needs of individuals and of industry in the area.

In addition to graduate courses in engineering, physics, mathematics, business administration, science, education, and the arts,

portions of undergraduate programs leading to the associate and bachelor's degrees, special programs for adults, and noncredit state-of-the-art programs are offered.

Warren Center

The Warren Center is a practical laboratory for Boston-Bouvé College in outdoor education and conservation, in group practicum, and in camping administration, programming, and counseling. At this Center in Ashland, completed in 1967, there are tennis courts, field hockey and lacrosse fields, waterfront for swimming and boating, overnight camp sites, fields and forests, heated cottages, the Hayden Lodge with a recreation hall, library, crafts shop, dining facilities, and conference accommodations.

Henderson House

The University's conference center, Henderson House, is located in Weston, Massachusetts. The Center for Continuing Education conducts short-term courses, seminars, and special institutes for business, professional, and research groups. Henderson House is 12 miles from the main campus.

Marine Science Institute

The Marine Science Institute at Nahant, Massachusetts, is a research and instructional facility primarily engaged in studies of marine biology and oceanography. The Institute is operated all year, and is about 20 miles northeast of Boston. Many of the courses at this institute are applicable toward an advanced degree in biology or health science.

Brockton, Nashua, and Framingham Campuses

For students residing in southeastern Massachusetts and northeastern Rhode Island, the Graduate School of Business Administration offers a major portion of its M.B.A. Program at facilities in Brockton, Massachusetts. These facilities, made available by the Veterans Administration Hospital, are conveniently located just off Route 24.

Students residing in the southern New Hampshire area may take a major portion of the M.B.A. Program at facilities in Nashua, New Hampshire. These facilities are furnished by Sanders Associates, Inc. and are located in their headquarters on Route 3, just over the Massachusetts line.

For students in the Framingham-Worcester area, a major portion of the M.B.A. Program may be taken at classroom facilities located in Framingham, Massachusetts.

college of criminal justice graduate program

The Graduate Program in Criminal Justice at Northeastern University offers both a full- and part-time program leading to a Master of Science degree. Students have the opportunity to choose among three major concentrations of study: administration, policy development, and planning; behavioral science theory; and research. Development of leadership qualities is stressed in each specialization. The purpose of the graduate program is to provide innovative concepts in academic study and research of crime using the criminal justice process.

The master's program in criminal justice concentrates on the problem of crime as a form of deviant behavior through a system established in response to that problem. The multidisciplinary academic program emphasizes a systems approach to criminal justice, and stresses organizational and management theory. Broad in concept, the program is to be understood as encompassing such related disciplines as law, sociology, political science, psychology, criminology, and public administration. Its primary educational function is to prepare individuals for research, teaching, and administration within a changing criminal justice system.

Faculty members represent several academic disciplines. Teaching activities vary in nature and depend on the instructor's specific objectives. Specialized areas include courses in community treatment, delinquency, correctional management, criminology, and criminalistics.

The goals of graduate study in the College of Criminal Justice are:

1. To develop leaders capable of assuming responsibility for policy planning, administration, and group leadership.
2. To prepare individuals for criminal justice teaching positions in community colleges and other educational institutions.
3. To provide students with the necessary skills and knowledge for applied research and facilitate their ability to discern problem areas.
4. To provide a foundation for advanced doctoral study.

FULL-TIME STUDY

Graduate study in criminal justice may be pursued through either a full- or part-time program. Full-time study allows for completion of course work within one academic year, beginning in September and ending in June of the following year. A substantial portion of the full-time student's time is devoted to academic study; however, simultaneous work on the thesis is expected during this period. Most students finish the thesis requirement in one additional quarter, thereby completing the program within one calendar year.

PART-TIME STUDY

Graduate study is also possible on a part-time basis. The part-time student is allowed to carry a maximum of two courses per quarter. Close consultation with a faculty adviser helps the part-time student determine a workable sequence of courses, and decide the number of credits to be carried each quarter. All degree requirements must be completed within five years from the date of enrollment.

GENERAL REGULATIONS

The general regulations and minimum requirements for all graduate programs are established by the Northeastern University Graduate Council. In some matters the committee of each graduate school is allowed discretion to establish regulations within limits defined by the Council. The regulations and academic requirements which follow have been formulated in accordance with this general policy.

Application

All applicants should address inquiries to the Graduate Program of Criminal Justice. Application forms and information will be mailed promptly.

Registration

Students must register within the period listed on the school calendar. Registration is not permitted after this period.

Residence

All work for advanced degrees must be completed in residence at the University, unless approval has been obtained from the Director of the Graduate Program of Criminal Justice for work taken elsewhere. Students who are in residence and using the facilities of the University must register for such work.

Grading System

The performance of students in graduate courses is recorded by the instructor, using the following grades:

- A Excellent
For performance of high graduate caliber
- B Satisfactory
For performance at a satisfactory level
- C Fair
For performance not at the level expected in graduate work
- F Failure
For unsatisfactory performance
- I Incomplete
For failure to complete course work

The designation I will be changed to a grade upon removal of the deficiencies which caused the I to be reported. Deficiencies must be removed within a period stipulated by the professor.

Any student who wishes to take a make-up examination must obtain permission from the professor teaching the course. A reasonable time period for the examination is discussed and set by the professor.

Class Hours and Credits

All credits at Northeastern University are entered as quarter-hour credits, with a quarter hour of credit being equivalent to three-fourths of a semester hour: i.e., 12 semester hours are equal to 16 quarter hours.

All classes in the Graduate Program in Criminal Justice meet on a quarter basis, with an academic quarter defined as a term of approximately 12 weeks' duration. The academic calendar in the front of this bulletin should be consulted to determine the opening dates of each quarter.

Continuity of Program

Students are expected to maintain continuous progress toward a degree. Any student who does not attend Northeastern for a period of one year must apply for readmission.

Withdrawals

In order to withdraw from a course, a student must fill out an official withdrawal form obtained at the Registrar's Office. Withdrawals may be made through the ninth class meeting of the quarter. Students will be withdrawn as of the date on which they complete

the form. Ceasing to attend a class or notifying the instructor does not constitute an official withdrawal. Petitions for withdrawal from a course after the ninth class meeting of the quarter must be submitted to the Director of the Graduate Program, and may be approved to avert unusual hardships on the student.

Students who do not attend the first two sessions will be dropped from the class unless they notify the Registrar of their intention to continue.

Changes in Requirements

The continuing development of the Graduate Program requires occasional revision of curricula. In every new bulletin, some improvements are indicated. When changes impose no hardships on the student and school facilities permit, the student is expected to meet the requirements of the latest bulletin. If the student finds it impossible to meet these requirements, the bulletin for the year in which he entered becomes the binding one.

Application for the Diploma

If a commencement card is not filed with the Registrar's Office on or before the applicable date listed on the calendar, there is no assurance that the degree will be granted in that particular year, even though all other requirements have been fulfilled.

THE MASTER OF SCIENCE DEGREE

Admission Requirements for Degree Candidacy

All applications for graduate study in Criminal Justice are reviewed by the Graduate Admissions Committee, and must include:

1. A completed application accompanied by a nonrefundable \$15 application fee.
2. Official transcript(s) from accredited institution(s) as evidence of earning a baccalaureate degree with a grade point average of approximately 3.0 or higher.
3. Official scores from the aptitude test of the Graduate Record Examination or Law School Aptitude Test; above-average scores are preferred.
4. Three letters of recommendation from academic, professional, or personal sources; academic references are preferred.
5. An essay of not more than 400 words which expresses academic and personal objectives.

No one factor is used to select candidates for the program. The Graduate Admissions Committee receives all applications and considers a variety of factors including previous work experience and professional potential, in addition to academic record and test

scores. When possible, students are asked to participate in an admissions interview to help the Committee make a complete evaluation.

Consideration for admission is given only after all application material, including the \$15 application fee, has been received by the Graduate Program in Criminal Justice.'

Student Classifications

Students whose credentials meet the criteria listed above are classified as full- or part-time regular students.

Part-time provisional students are individuals who did not meet admission standards but, in the opinion of the Graduate Committee, have the potential for graduate work. Applicants for full- or part-time regular status whose credentials do not warrant acceptance are automatically considered for part-time provisional status.

Upon completion of 12 quarter hours of course work at North-eastern, the provisional student must request a transfer to regular student status in the Graduate Program. To be considered for transfer, six of the 12 credits must be from required courses offered by the Graduate Program in Criminal Justice with a grade of at least B. An overall cumulative grade average of B must be maintained in courses taken outside the College of Criminal Justice.

Special students may take courses on a nondegree basis only by obtaining permission from individual instructors. Should a special student desire admission to the degree program as a regular student, he/she must meet standard admission requirements. Up to 12 credits (no more than two courses per quarter) may be taken as a special student before applying for admission. All courses must result in a grade of B or better; if 12 credits have been completed, six must be from required courses.

Academic Requirements for the Master's Degree

All candidates for the Master's Degree in Criminal Justice are required to complete the following:

1. A total of 42 hours of course credit.
2. Thirty-six of the total 42 hours completed in classroom work, 18 of which are required courses and 18 elective courses.
3. Completion of an acceptable thesis valued at six credits.
4. Satisfactory performance on a comprehensive written examination. Full- and part-time students may apply to take the comprehensive examination when they have completed all course requirements.

Students in the program must earn a grade of B or above in all required and elective courses offered within the Graduate Program in Criminal Justice. An average of B or above is also required in all other elective courses taken within the University. Each student

is expected to maintain an overall average of B or better in all course work to remain in the program.

Within the above limitations, a criminal justice required or elective course for which a grade of F is received must be repeated with a grade of B or better, and may be repeated only once. If a grade of F is received in a university elective course, that course may be repeated once to obtain a grade of C or better, or another elective course may be substituted. If a grade of C is received in a required course, provisions may be made with the professor to correct the deficiency.

Program Selection

Upon acceptance as a degree candidate, the student is assigned a temporary adviser in his/her major area of concentration. In consultation with his/her adviser, the student develops a program of study, including program objectives, anticipated courses, and estimated dates of completion of the various degree requirements. The temporary adviser also helps the student select a thesis committee which assists him/her in all academic matters, as well as in the development and completion of the thesis.

Transfer Credits

Individuals who have been enrolled in other graduate degree programs, who have earned a graduate degree, or who have taken graduate courses on a non-degree basis may be granted credit at the discretion of the Graduate Committee. A maximum of 12 quarter hours of credit from another institution is acceptable providing it meets specified requirements. Courses should be the equivalent of or comparable to courses offered in the Graduate Program in Criminal Justice. If accepted, each course represents three quarter hours of credit. A petition for transfer of credit, obtainable from the College of Criminal Justice, together with official transcripts and course descriptions from the institution(s) attended, must be provided before committee action will be taken.

Comprehensive Examination

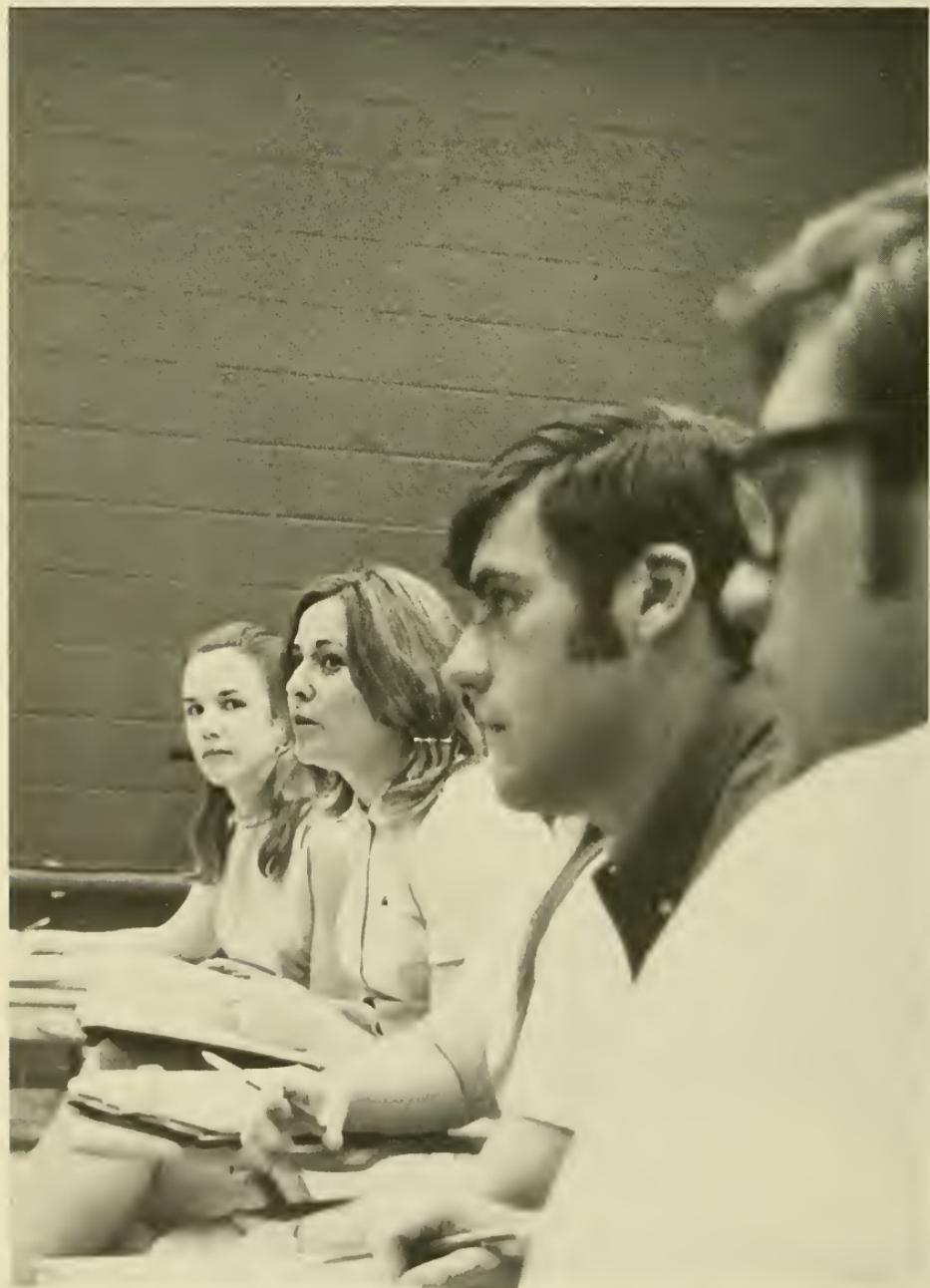
Each candidate takes a comprehensive examination no later than one month prior to the expected date of graduation. This examination may be taken when the candidate has completed all course requirements, as the subjects tested are commensurate with the student's area of concentration.

A grade of B or better must be achieved in the examination. A student who fails may be given a reexamination under conditions determined by the Director of the Graduate Program or his designate.

Thesis

Each candidate must submit a thesis which exhibits his research ability, and increases his scope of individual specialization. The thesis proposal is submitted for approval to the candidate's thesis committee: a chairman and one or two members proposed by the student. Once approved, the thesis committee serves as an advisory board on idea development. The completed thesis must be approved by the thesis committee, graduate committee, and Director of the Graduate Program.





financial information

FINANCIAL OBLIGATIONS

Tuition

Tuition rates and fees are subject to revision by the Board of Trustees at any time. However, any change in tuition and fees will become effective at the beginning of the school year which follows the one in which the change was announced.

Tuition for master's degree candidates and special students is \$57 per quarter hour of credit.

Tuition statements are mailed to students by the Bursar's Office and are payable by check to Northeastern University on or before the date specified.

Fees

All applications must be accompanied by a nonrefundable application fee of \$15. No application will be processed until the fee has been received by the Graduate Program in Criminal Justice. Checks should be made payable to Northeastern University and sent, with the application, to the Graduate Program in Criminal Justice, Northeastern University, 360 Huntington Avenue, Boston, Massachusetts 02115.

Other fees include a charge of \$10 for late payment of tuition and a fee of \$25 for all degree candidates, payable before commencement by the applicable date listed on the academic calendar.

Full-time students are charged \$12.50 per quarter for the services available in the Student Center; part-time students pay \$.75 a quarter.

All financial obligations to the University must be discharged prior to graduation.

Refunds

Tuition refunds are granted only on the basis of the date appearing on the official withdrawal form filed by the student. Nonattendance does not constitute official withdrawal. Questions regarding refunds should be discussed with the Bursar's Office.

Refunds will be granted in accordance with the following schedule:

Official Withdrawal Filed Within	Percentage of Tuition Refunded
First week of quarter	100
Second week	75
Third week	50
Fourth week	25

FINANCIAL AID

There is a limited amount of financial aid for part-time students enrolled in the Graduate Program in Criminal Justice. Graduate assistantships and/or fellowships in the College are not available to part-time students. A limited number of research fellowships may be available to qualified full-time graduate students. Research fellows are selected on the basis of academic background, research potential, and a written research proposal. Assigned duties require 18-20 hours per week for which the student receives a stipend of \$3450 per calendar year and a tuition waiver.

Martin Luther King, Jr., Scholarships

A limited number of full- and part-time Martin Luther King, Jr., Fellowships are available. These scholarships provide for remission of tuition and all fees, and are awarded to qualified black students on the basis of financial need. Additional information and application forms are available from the Office of Financial Aid.

Dormitory Proctorships

A number of proctorships in men's dormitories on or near the Huntington Avenue Campus are available each year. Appointments carry a minimum compensation of room and board. Further information and application forms may be obtained from the Office of University Housing.

National Direct Student Loan

Under provisions of an act of the Federal government, students carrying an academic load of one half or more are entitled to loans up to \$2,500 for one school year and up to a total of \$10,000 for undergraduate and graduate work. The actual amount of any award will be determined on the basis of need and academic promise.

The repayment period begins nine months after the borrower ceases to carry a half-time load and extends 10 years from that point at an annual interest rate of three percent. Up to 100 percent may be cancelled for teachers in special education. Additional

information and application forms are available from the Office of Financial Aid. The application deadline is September 1 for full-time students and one month prior to the start of the quarter for which aid is requested for other students.

Higher Education Loan Plan (Guaranteed Student Loan Plan)

Educational assistance loans may be available from certain banks in the student's home town. These loans, guaranteed by state agencies, carry an interest charge of seven percent, three percent of which is paid by the Federal government. Graduate students may borrow up to \$2,500 for each year of study up to a maximum of \$10,000 for both undergraduate and graduate work. Monthly repayment begins nine to 12 months after completion of study, and extends up to five years for amounts less than \$2,000 or to 10 years for amounts greater than \$2,000. Applicants for this loan are required to complete a need analysis form. Additional information and application forms are available from the Office of Financial Aid.

Law Enforcement Assistance Administration

The Law Enforcement Assistance Administration, U.S. Department of Justice, has set up an Office of Academic Assistance under authority of the Omnibus Crime Control and Safe Streets Act of 1968, Public Law 90-351. Through the University, loans up to \$2,200 per year for tuition and grants up to \$250 per academic quarter for tuition and fees are available to law enforcement personnel in undergraduate or graduate programs leading to degrees or certificates in areas directly related to law enforcement.

The loans, limited to full-time students in or preparing for law enforcement or corrections careers, are cancelled at the rate of 25 percent for each year the recipient subsequently serves in law enforcement at federal, state, or local level.

The grants are available to full-time or part-time students employed in a publicly-funded law enforcement agency, and involve a signed agreement to remain in the service of a law enforcement agency employing such applicant for two years following completion of the course for which aid was given.

Applications for loans or grants should be obtained from the Office of Financial Aid, Room 252 Richards Hall.

Please note: Aid granted from programs sponsored by the federal government is dependent upon the amount of funds allocated to Northeastern. The University does not award financial assistance in any form to non-citizens of the United States.



faculty

GRADUATE TEACHING FACULTY AND STAFF OF THE COLLEGE OF CRIMINAL JUSTICE

Ames, Lois, B.A., M.A., A.C.S.W. certified, *Assistant Professor of Criminal Justice*

Croatti, Robert, B.S., *Assistant to the Dean of Criminal Justice*

Cunliffe, Frederick, B.S., M.S., Ph.D., *Professor of Criminal Justice*

Deming, Romine, B.A., M.S., Ph.D., *Associate Professor of Criminal Justice*

Jimenez, Robert, B.S., M.D., *Lecturer in Criminal Justice*

Kassler, Haskell, B.A., J.D., *Assistant Professor of Criminal Justice*

Natoli, Richard, B.S., M.A., *Assistant Professor of Criminal Justice*

Perry, Reynold, B.S., *Administrative Assistant Graduate Program in Criminal Justice*

Reed, James, B.F.A., M.A., *Assistant Professor of Criminal Justice*

Rosenblatt, Norman, B.A., M.A., Ph.D., *Dean of the College of Criminal Justice, Director of the Graduate Program in Criminal Justice*

Schafer, Stephen, D. Jur., Prof. Agrégé, *Professor of Criminal Justice*

Senna, Joseph, B.A., M.S.W., J.D., *Associate Professor of Criminal Justice*

Sheehan, Robert, B.A., M.A., *Professor of Criminal Justice*

Siegel, Larry, B.A., M.A., *Assistant Professor of Criminal Justice*

Turek, Donna, B.A., M.A., *Assistant Professor of Criminal Justice*

Wintersmith, Robert, B.A., M.S.W., M.A., Ph.D., *Lecturer in Criminal Justice*

fields of study

PROGRAMS IN PROFESSIONAL SPECIALIZATIONS

Master of Science

The master's curriculum is divided into three categories of major concentration: Criminal Justice Administration, Behavioral Science Theory, and Research. Model and specimen programs for each concentration can be found on pages 40-43 in this bulletin.

Students must choose one of the three concentrations and complete one of the programs outlined in the following pages.

Group I Core Curriculum (18 Credits)

This group consists of all required graduate courses offered and taught by the faculty of the College of Criminal Justice. Core courses are taken by all students regardless of major concentration or elective interest. The core curriculum encompasses a broad area of topical information, and comprises a solid foundation for graduate study in criminal justice.

Course

Administration of Criminal Justice	3
Theories in Criminology	3
Legal Issues in Criminal Justice	3
Criminal Justice Planning and Development	3
Statistical Analysis	3
Research Methods in Criminal Justice I	3
	<hr/>
THESIS	18 credits
	<hr/>
Elective Courses	6
	<hr/>
TOTAL PROGRAM	24 credits
	<hr/>
	18
	<hr/>
	42 credits

Group II

The following list is of elective courses which are offered and taught by the faculty of the Graduate Program in Criminal Justice. These courses involve more specific problems of crime and criminal justice, while the required courses are more general in nature and emphasize the comprehensive systems approach to criminal justice.

Course

Conflict Management in Criminal Justice	3
Deviance, Stigma, and Justice	3
Correctional Services in the Community	3
Penology	3
Juvenile Justice and Delinquency	3
Forensic Science	3
Research Methods II	3
Field Practicum	3

Group III Elective Curriculum

Elective courses offered by and taught in the following graduate programs may be credited toward meeting degree requirements for the Master of Science in Criminal Justice.

Graduate School of Arts and Sciences
Graduate School of Business Administration
School of Law
Graduate School of Professional Accounting
Graduate School of Engineering
Graduate School of Education
Graduate School of Pharmacy and Allied Health Professions
Graduate School of Boston Bouvé College

MODEL PROGRAM
MASTER'S DEGREE PROGRAM IN CRIMINAL JUSTICE

QUARTER I

Course	Credits
Administration of Criminal Justice	3
Theories in Criminology	3
Statistical Analysis	3
Elective	3
Total	<u>12</u>

QUARTER II

Course	Credits
Research Methods I	3
Legal Issues in Criminal Justice	3
Elective	3
Elective	3
Total	<u>12</u>

QUARTER III

Course	Credits
Criminal Justice Planning and Development	3
Elective	3
Elective	3
Elective	3
Total	<u>12</u>

SUMMARY

	Credits
Thesis	6
Required Courses in Criminal Justice	18
Electives from Criminal Justice and University	18
TOTAL	<u>42</u>

SPECIMEN PROGRAM I**MAJOR CONCENTRATION****Administration, Policy Development, and Planning****QUARTER I**

Course	Credits
Administration of Criminal Justice	3
Theories in Criminology	3
Statistical Analysis	3
Criminal Justice Elective	3
Total	<u>12</u>

QUARTER II

Course	Credits
Research Methods I	3
Legal Issues in Criminal Justice	3
Criminal Justice Elective	3
Functions and Techniques of Public Management (22.874)	3
Total	<u>12</u>

QUARTER III

Course	Credits
Criminal Justice Planning and Development	3
Criminal Justice Elective	3
Urban Sociology (21.885)	3
Organization and Administrative Theory (50.953)	3
Total	<u>12</u>

SUMMARY

	Credits
Thesis	6
Required Courses in Criminal Justice	18
Elective Courses in Criminal Justice	9
Elective Courses from University	9
TOTAL	<u>42</u>

SPECIMEN PROGRAM II**MAJOR CONCENTRATION****Behavioral Science Theory****QUARTER I**

Course	Credits
Administration of Criminal Justice	3
Theories in Criminology	3
Statistical Analysis	3
Criminal Justice Elective	3
Total	<u>12</u>

QUARTER II

Course	Credits
Research Methods I	3
Legal Issues in Criminal Justice	3
Criminal Justice Elective	3
Personality and Social Structure (50.805)	3
Total	<u>12</u>

QUARTER III

Course	Credits
Criminal Justice Planning and Development	3
Criminal Justice Elective	3
Foundations of Social Theory (21.805)	3
Social Psychology I (19.920)	3
Total	<u>12</u>

SUMMARY

	Credits
Thesis	6
Required Courses in Criminal Justice	18
Elective Courses in Criminal Justice	9
Elective Courses from University	9
TOTAL	<u>42</u>

SPECIMEN PROGRAM III**MAJOR CONCENTRATION****Research****QUARTER I**

Course	Credits
Administration of Criminal Justice	3
Theories in Criminology	3
Statistical Analysis	3
Criminal Justice Elective	3
Total	12

QUARTER II

Course	Credits
Research Methods I	3
Legal Issues in Criminal Justice	3
Criminal Justice Elective	3
Operations Research for Criminal Justice	3
Total	12

QUARTER III

Course	Credits
Criminal Justice Planning and Development	3
Criminal Justice Elective	3
Research Methods II	3
Introduction to Data Processing	3
Total	12

SUMMARY

	Credits
Thesis	6
Required Courses in Criminal Justice	18
Elective Courses in Criminal Justice	12
Elective Courses from University	6
TOTAL	42

COURSES

DESCRIPTION OF COURSES

All courses carry three quarter hours of credit unless otherwise specified.

92.904 Administration of Criminal Justice

A description and analysis of the criminal justice process from prevention and arrest to release after incarceration. Concentration is on a systems approach to understanding criminal behavior. The philosophies, practices, and procedures of agencies responsible for the administration of justice are viewed and critical efforts made to deal with the effectiveness of different approaches to crime control.

92.907 Theories in Criminology

The history and development of criminological theories from ancient to contemporary times. It examines the assumptions of theoretical models and relates them to the development of criminal policies. Psychological, sociological, and cultural theories underlying deviant criminal behavior are reviewed.

92.910 Nature and Extent of Crime

An extensive examination into the nature and volume of crime in the U.S. and foreign countries. Course content includes types of crimes and offenders, geographic distribution of crime patterns, cost of crime, and a critical review of techniques used to measure crime.

92.913 Criminal Justice Planning and Development

Introduction to planning techniques and their impact on criminal justice program development, now and in the future. Policy and decision making procedures pertaining to affiliated agencies and organizations are analyzed. The extent of planning for crime control on local, state, regional, and national level is studied. The peculiar nature of urban crime problems in relation to planning is also reviewed. Planning involves identification of problem areas, diagnosing causation, formulating solutions, alternative strategies, and mobilizing resources necessary to effect change in the system.

92.916 Statistical Analysis

An analysis of the application of statistics in research, and the basic assumptions underlying statistical procedures. The course covers descriptive and inferential statistical procedures such as sampling, laws of probability theory, hypothesis testing, analysis of variance, and multiple regression.

(Students with a background in statistics may make a special request to replace this course with an elective.)

92.957 Research Methods in Criminal Justice I

Survey of methods and approaches utilized for independent research, as well as the evaluation of existing criminal justice programs. It considers research methods and empirical findings through assigned research techniques including design, instrument construction, data processing, and analysis interpretation.

92.958 Research Methods in Criminal Justice II

Advanced research design problems are examined. Criminal justice programs are evaluated quantitatively, with concentration placed on coding, schedule construction, sampling theory, and statistical models measuring causation.

92.841 Criminal Law

General principles of the criminal law, including the concept of responsibility for crimes, limitations on capacity and basic elements of crimes. The sources and purposes of criminal law are analyzed, and different conceptions of crime and current law reform are discussed.

92.800 Law Enforcement Practices

This course involves a study of the current theory and practices in the field of law enforcement. Major problems which confront the law enforcement process are considered, as well as the methods now used by law enforcement agencies.

92.804 Correctional Services in the Community

An analysis of treatment and supervisory activities, including probation and parole for offender groups while in the community. There is a thorough exploration of community resources and services such as vocational rehabilitation, welfare services, mental health clinics, employment services, and legal aid. Effectiveness of community treatment is examined through case studies.

92.810 Penology and Corrections

This course deals essentially with the process of incarceration and the social structure of the prison community. Consideration is given to management, operation effects, and the effectiveness of different

institutions. Modern correctional approaches and current rehabilitation practices are also discussed.

92.816 Social Deviance

Crime as a form of social deviance is studied through intensive reading of a wide range of sociological literature on deviant behavior and its relationship to crime. Included are relevant selections from Durkheim, Merton, Cohen, Goffman, Becker, Matza, Ohlin and Schur.

92.851 Juvenile Justice and Delinquency

A study of the juvenile justice system beginning with community concern to the subsequent disposition. The class analyzes juvenile and family court procedures, as well as questions of jurisdiction. Various theories of delinquency developed from law, sociology, psychology, and related disciplines are also covered.

92.822 Forensic Science

The development of forensic science is summarized according to its effects on the criminal justice system. Lecture and laboratory work examine various ways the physical sciences contribute to the establishment of scientific criminal evidence. Designed primarily for students who plan to enter a profession requiring an understanding of criminalistics.

92.828 Field Practicum

Field instruction in a criminal justice agency where the instruction may be given in administration, research, teaching and/or related activities. Students have the opportunity to apply theoretical concepts in a practical, applied fashion by observing and contributing to the daily activities of operating agencies and organizations.

92.860 Conflict Management in Criminal Justice

An examination of problems in conflict management. Concepts and definitions of social conflict are explored, as well as comparisons between functional and dysfunctional conflict. Inquiries into representative conflict management strategies and techniques are made which afford the opportunity to relate general theory and research results to practical situations of criminal justice conflict management. A variety of heuristic techniques are anticipated, such as: scenarios, roleplaying, and use of audio-visual media.

92.809 Deviance, Stigma and Justice

Stigmatization is accurately defined as it is found to exist in different segments of our society. Its history in the United States is traced through examples of specific topics, such as: employment of ex-offenders, social acceptance of mental patients, ethnic discrimination, and homosexuality.

92.806 Conflicting Values and the Criminal Justice System

An investigation of ideologies, institutions, and ethnic mores as they affect black values and reactions to the criminal justice system. Integration, rebellion, and institutionalization are subjects of discussion.

92.830 History of Police in the United States

A review of the history of police activities in the United States emphasizing black community relations. The study of previous policy provides a broad, revealing perspective from which to view contemporary departments. From this framework, the class analyzes societal expectations of the police.

92.808 Criminal Behavior, Psychiatry, and the Public

An introduction to the field of psychiatric criminology which examines the known psychological sources of criminal behavior. Psychiatric concepts are applied to crime prevention, the examination and rehabilitation of the offender, and the legislative process.

92.862 Drug Abuse, Mental Health and the Public

An introductory course concerning drug abuse. The mental health and medico-legal aspects of the problem are emphasized by concentrating on the areas of prevention and rehabilitation, public attitudes on drug abuse, and drug abuse education.

92.905 Legal Issues in Criminal Justice

An in-depth study of contemporary legal questions faced by criminal justice professionals. Emphasis is placed on constitutional problems, as well as the judicial review of administrative decisions made by criminal justice organizations. Topics to be considered are: selected provisions of the United States Constitution with particular emphasis on amendments 4, 5, 6, and 14; questions of electronic surveillance; right to counsel; line-up, bail and right to speedy trial; sentencing; legal aspects of probation and parole; and prisoners' rights.

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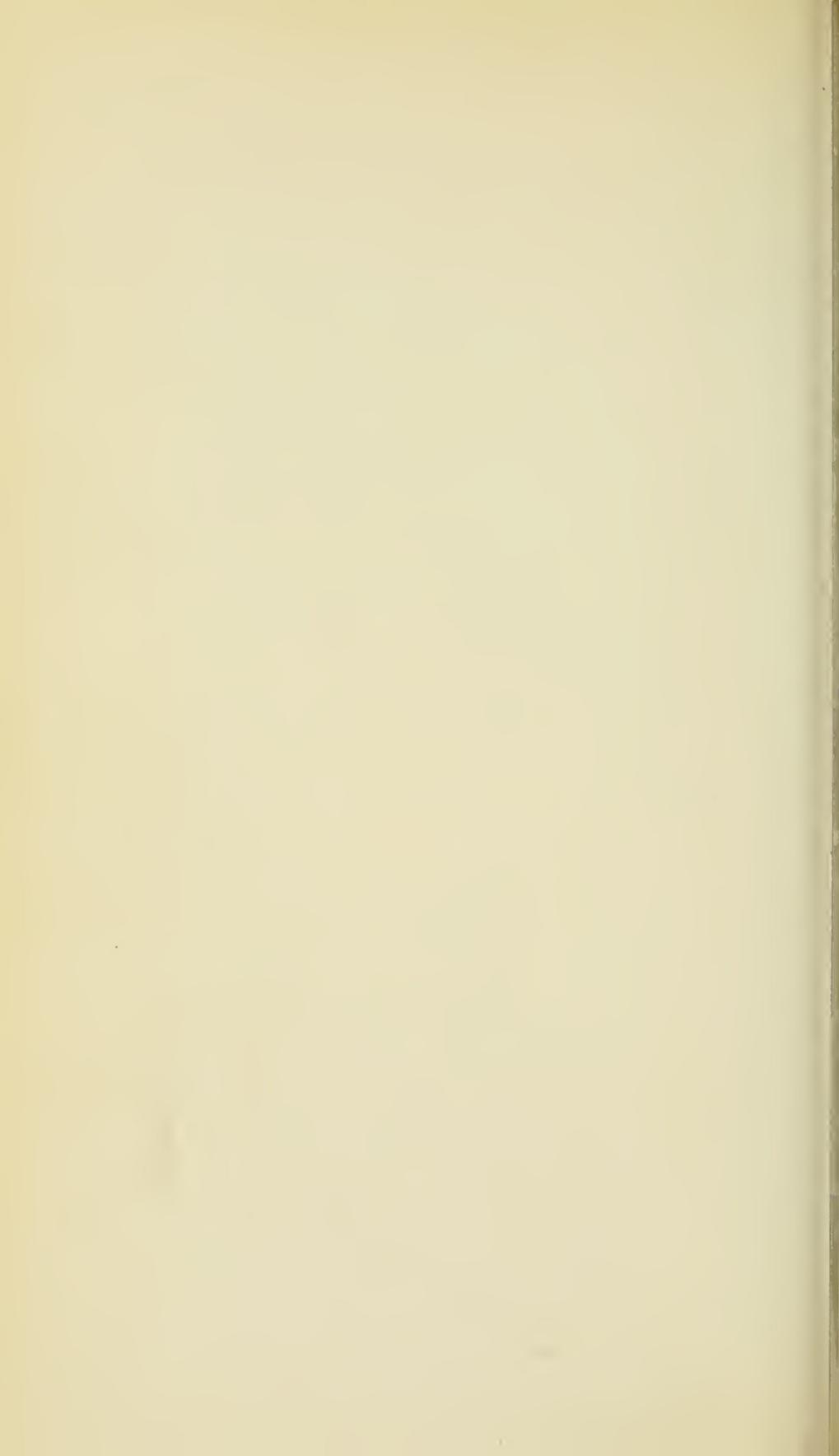
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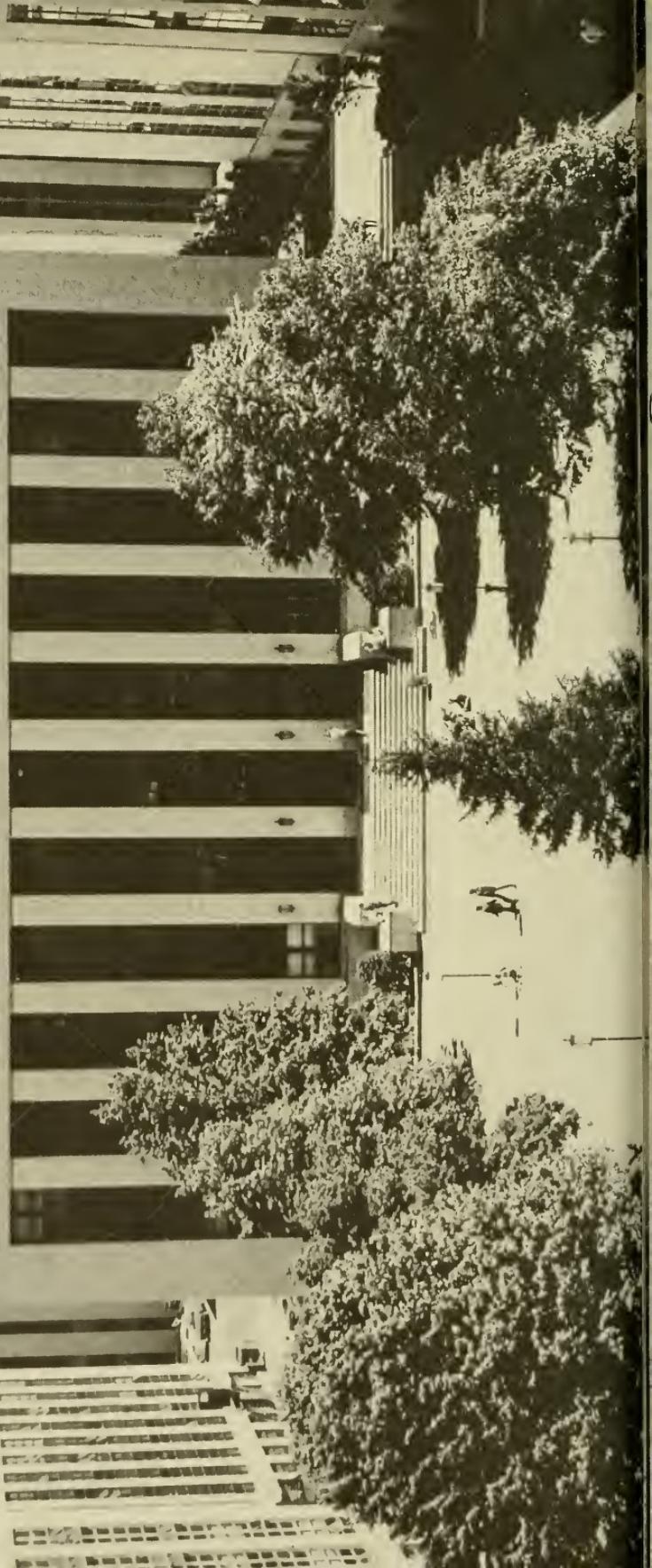
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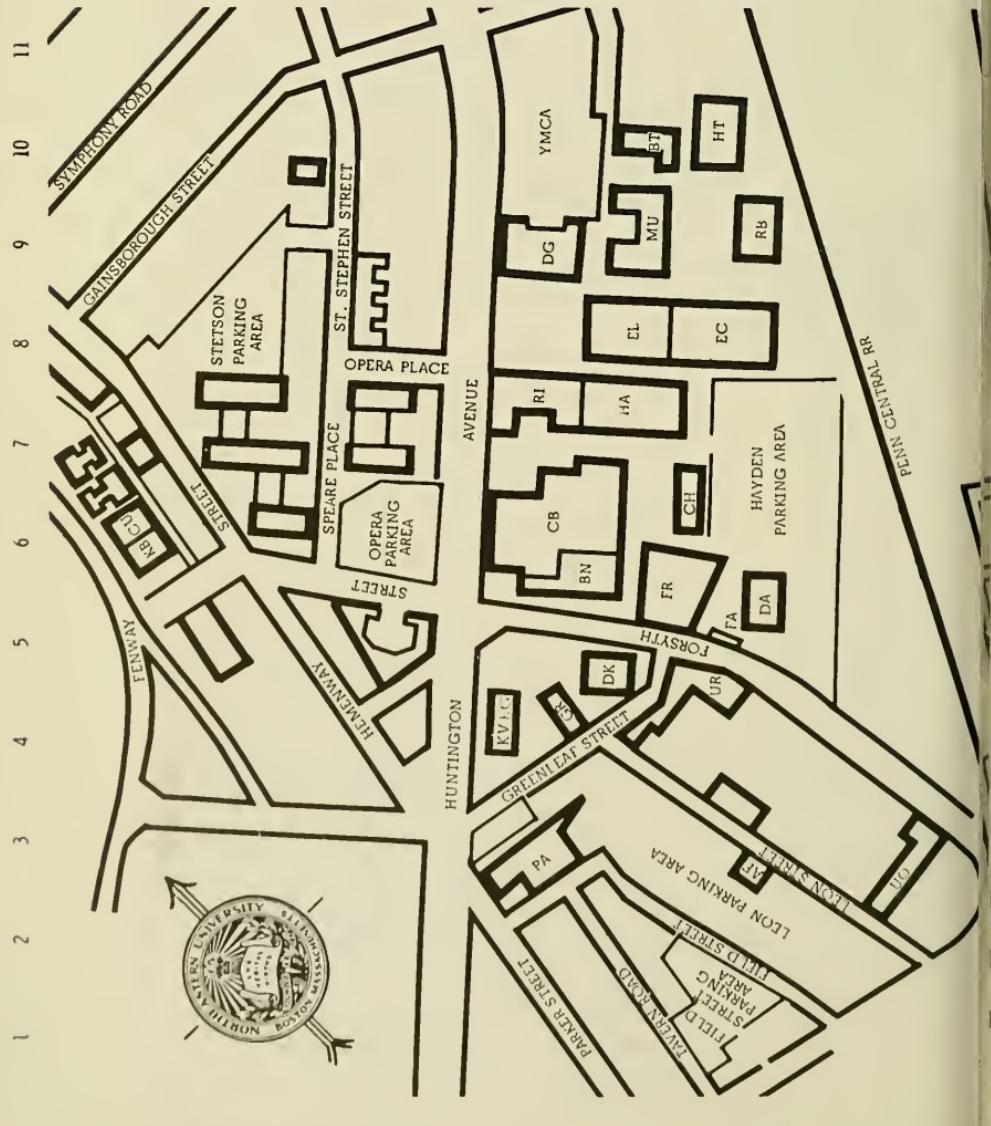
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<u>MAP REFERENCE</u>	<u>Building</u>	<u>Designation</u>
F6	Bartlett Natatorium	BN
F10	Botoloff Building	BT
E6	Cabot Physical Education Ctr.	CB
G7	Churchill Hall	CH
A6	Cushing Hall	CU
H6	Dana Research Center	DA
F5	Dockser Hall	DK
E9	Dodge Library	DG
G8	Elli Student Center and Alumni Auditorium	EC
F8	Forsyth Building Annex	EL
G6	Forsyth Building	FR
G5	Greenleaf Building	FA
F4	Hayden Hall	GR
F7	Hurtig Hall	HA
G10	Kennedy Building	HT
B6	Knowles Center (Volpe)	KB
E4	Knowles Center (Gryzmish)	KV
E4	11 Leon Street	KG
J3	Afro-American Institute	UO
H3	Mugar Life Sciences Building	AF
F9	Parker Building	MU
F3	Richards Hall	PA
E7	Robinson Hall	RI
H9	United Realty Building	RB
G5		UR



ACADEMIC CALENDAR 1974-1975

Fall Quarter 1974

Registration period		
Burlington	Tuesday-Wednesday	Sept. 17-18
Boston	Monday-Thursday	Sept. 23-26
Classes begin	Monday	Sept. 30
Examination period	Monday-Saturday	Dec. 16-21

Winter Quarter 1974-1975

Registration period		
Burlington	Tuesday	Dec. 3
Boston	Monday-Thursday	Dec. 9-12
Classes begin	Monday	Jan. 6
Examination period	Monday-Saturday	Mar. 24-29

Spring Quarter 1975

Registration period		
Burlington	Tuesday	March 11
Boston	Monday-Thursday	Mar. 17-20
Classes begin	Monday	April 7
Last day to file commencement card for Spring Commencement	Tuesday	April 1
Last day to pay fee for Spring Commencement	Wednesday	April 30
Final grades due in Registrar's Office for June graduates taking third quarter course	Friday	June 6
Examination period	Monday-Saturday	June 16-21
Spring Commencement	Sunday	June 22

Summer Quarter 1975

Registration period		
Burlington	Monday-Tuesday	June 16-17
Boston	Wednesday-Thursday	June 18-19
Classes begin	Monday	June 30
Last day to file commencement card for Fall Commencement	Tuesday	July 1
Last day to pay fee for Fall Commencement	Friday	August 1
Examination period	Wednesday-Saturday	Aug. 6-9

UNIVERSITY HOLIDAYS 1974-1975

Columbus Day	Monday	October 14
Veterans' Day	Monday	October 28
Thanksgiving Recess	Thursday-Saturday	Nov. 28-30
Christmas Vacation	Monday-Saturday	Dec. 23-Jan. 4
Washington's Birthday	Monday	February 17
Patriot's Day	Monday	April 21
Memorial Day	Monday	May 26
Independence Day	Friday	July 4
Labor Day	Monday	September 1

Equal Opportunity Policy

Northeastern University is committed to a policy of providing equal opportunity for all. In all matters involving admission, registration, and all official relationships with students, including evaluation of academic performance, the University insists on a policy of nondiscrimination. Northeastern University is also an equal opportunity employer; it is institutional policy that there shall not be any discrimination against any employee or applicant for employment because of race, color, religion, sex, age or national origin. In addition, Northeastern takes affirmative action in the recruitment of students and employees.

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Maurice Kaufman
°Christopher Kennedy

Robert D. Klein
°Melvin Mark
Edward S. Marshall
Robert W. Miller
Richard G. Natoli
Irene A. Nichols
Welville B. Nowak
°Paul M. Pratt
John F. Reinhard
°Daniel J. Roberts, Jr.
°Norman Rosenblatt
J. Spencer Rochefort
°Kenneth G. Ryder
Eugene J. Saletan
Kathryn J. Shaffer
°Robert A. Shepard
Ruth E. Sullivan
Roy Weinstein
Paul C. Wermuth
M. Delaine Williamson

Presiding Officer

Asa S. Knowles
or
Arthur E. Fitzgerald

ORGANIZATION OF THE GRADUATE SCHOOLS

Administration

Catherine L. Allen, Ed.D., Ph.D., *Director of Boston-Bouvé College Graduate School*
Francis W. Casey, B.A., *Registrar of the Graduate Schools*

°Appointed by the President

Geoffrey Crofts, B.Comm., *Director of the Graduate School of Actuarial Science*
Philip T. Crotty, Jr., A.B., M.A., M.B.A., Ed.D., *Associate Dean of Business Administration*
Joseph M. Golemme, M.A., *Director of the Graduate School of Professional Accounting*
George W. Hankinson, M.S., *Director of the Graduate School of Engineering*
Linda D. Johnson, B.A., *Associate Registrar of the Graduate Schools*
John W. Jordan, M.Ed., *Director of the Graduate School of Business Administration*
Thomas J. Kerr, B.S.I.E., M.S.I.E., *Assistant Director of the Graduate School of Engineering*
Robert H. Ketchum, Ph.D., *Director of the Graduate School of Arts and Sciences*
John J. McKenna, M.A., *Assistant Director, Graduate School of Actuarial Science*
Norman Rosenblatt, Ph.D., *Director of the Graduate Program in Criminal Justice*
Philip J. Rusche, Ed.D., *Director of the Graduate School of Education*
Albert Soloway, B.S., Ph.D., *Director of the Graduate School of Pharmacy and Allied Health Professions*
Henry G. Tritter, M.Ed., *Coordinator of Admissions, Graduate School of Education*
Janice Walker, A.B., *Assistant Director of the Graduate School of Education*

**University Graduate Council
1974-1975**

The Council determines broad policies and regulations governing the conduct of graduate work. All new graduate programs must be approved by the Council.

OFFICERS

Arthur E. Fitzgerald, Chairman, *Vice President for Academic Affairs and Dean of Faculty*
John L. Neumeyer, Vice Chairman, *Chairman of the Executive Committee of the Graduate Council*
Sidney Herman, Secretary, *Associate Dean of Faculty*

Administrative Members

Catherine L. Allen, *Dean of Boston-Bouvé College and Director of Boston-Bouvé College Graduate School*
Philip T. Crotty, Jr., *Associate Dean of Business Administration*

George W. Hankinson, *Director of the Graduate School of Engineering*
James S. Hekimian, *Dean of Business Administration*
John W. Jordan, *Associate Dean of Business Administration and Director
of the Graduate School of Business Administration*
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Robert H. Ketchum, *Director of the Graduate School of Arts and Sciences*
Melvin Mark, *Dean of Engineering*
Frank E. Marsh, *Dean of Education*
Norman Rosenblatt, *Dean of the College of Criminal Justice and
Director of the Graduate Program in Criminal Justice*
Philip J. Rusche, *Associate Dean of Education and Director of the
Graduate School of Education*
Robert A. Shepard, *Dean of Liberal Arts*

Elected Faculty Members

David Barkley, *Professor of Political Science*
Paul V. Croke, *Associate Professor of Management*
Ernest M. DeCicco, *Associate Professor of Economics*
David I. Epstein, *Professor of Mathematics
and Chairman of the Department*
Austin Fisher, *Professor of Engineering Management*
Janis Z. Gabliks, *Associate Professor of Biology*
Blanche Geer, *Professor of Sociology*
George Goldin, *Professor of Special Education
and Director of Rehabilitation Institute*
Bernard M. Goodwin, *Associate Professor of Chemical Engineering*
Albert Kovner, *Associate Professor of Education*
Robert C. Lieb, *Associate Professor of Management*
Morton Loewenthal, *Associate Professor of Electrical Engineering*
Wesley Marple, *Coordinator, Finance Group, and Professor of Finance*
Albert McCay, *Professor of Recreation Education
and Chairman of the Department*
Harold Miner, *Associate Professor of Science Education*
John L. Neumeyer, *Professor of Medicinal Chemistry*
Irene Nichols, *Associate Professor of Psychology in Education*
Welville B. Nowak, *Snell Professor of Engineering*
Barbara Philbrick, *Assistant Professor of Physical Education*
John D. Post, *Assistant Professor of History*
Robert Raffauf, *Professor of Pharmacognosy and Medicinal Chemistry*
John F. Reinhard, *Professor of Pharmacology*
Richard J. Scranton, *Assistant Professor of Civil Engineering*

Joseph Senna, Associate Professor of Criminal Justice
Albert Soloway, Chairman of the Department of Medicinal Chemistry and Pharmacology and Director of the Graduate School of Pharmacy and Allied Health Professions
Yogendra N. Srivastava, Associate Professor of Physics
Michael Terman, Associate Professor of Psychology
Dharmendra Verma, Associate Professor of Marketing
Elizabeth Van Slyck, Professor of Physical Therapy
Arthur Weitzman, Professor of English
Robert N. Wiener, Associate Professor of Chemistry
Richard Zobel, Professor of Physical Education

Administrative Committee of the Graduate Schools

Sidney Herman, Chairman, Associate Dean of Faculty
Francis W. Casey, Secretary, Registrar of the Graduate Schools
Catherine L. Allen, Director of Boston-Bouvé College Graduate School
Alvah K. Borman, Dean of Graduate Placement Services
Barbara Burke, Executive Assistant to the Dean of the School of Law and Director of Placement for the School of Law
Geoffrey Crofts, Director of the Graduate School of Actuarial Science
Philip T. Crotty, Jr., Associate Dean of Business Administration
Joseph M. Golemme, Director of the Graduate School of Professional Accounting
George W. Hankinson, Director of the Graduate School of Engineering
James S. Hekimian, Dean of Business Administration
John W. Jordan, Associate Dean of Business Administration and Director of the Graduate School of Business Administration
LeRoy C. Keagle, Dean of the College of Pharmacy and Allied Health Professions
Robert H. Ketchum, Assistant Dean of Liberal Arts and Director of the Graduate School of Arts and Sciences
Alan A. Mackey, Associate Dean of University Administration and University Registrar
Melvin Mark, Dean of Engineering
Frank E. Marsh, Jr., Dean of Education
Edmund J. Mullen, Assistant Dean of University Administration and Associate University Registrar
John C. O'Byrne, Dean of the School of Law
Barbara Philbrick, Assistant Professor of Physical Education and Coordinator of Programs for Boston-Bouvé College Graduate School
Marianne Radziewicz, Registrar of the School of Law

Norman Rosenblatt, *Dean of Criminal Justice and Director
of the Graduate Program in Criminal Justice*
Philip J. Rusche, *Director of the Graduate School of Education*
Robert A. Shepard, *Dean of Liberal Arts*
Albert Soloway, *Director of the Graduate School of Pharmacy and Allied
Health Professions*

Ex Officio

Arthur E. Fitzgerald, *Dean of Faculty*
Rudolph M. Morris, *Dean of University Administration*
Loring M. Thompson, *Dean of Planning*

**Committee of the Graduate School of Education
1972-1973**

Philip J. Rusche, *Associate Dean of Education and Director of the
Graduate School of Education, Chairman*
Frank E. Marsh, Jr., *Dean of Education*
Arlis Aron, *Instructor in Speech Pathology and Audiology*
Gilbert C. Garland, *Professor of Education*
George J. Goldin, *Professor of Special Education*
Albert Kovner, *Associate Professor of Education*
Harold A. Miner, *Associate Professor of Education*
Irene A. Nichols, *Associate Professor of Education*

the university

Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under the General Laws of Massachusetts. The State Legislature by special enactment has given the University general degree-granting powers. The University is governed by a Board of Trustees elected by and from the Northeastern University Corporation, which is composed of 178 distinguished business and professional men and women.

From its beginning, Northeastern University has had as its dominant purpose the discovery of community educational needs and the meeting of these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Cooperative Plan, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922), Liberal Arts (1935), Education (1953), Pharmacy (1962), Nursing (1964); Boston-Bouvé College (1964); the College of Criminal Justice (1967); and by Lincoln College's daytime Bachelor of Engineering Technology program (1971). This educational method enables students to gain valuable practical experience as an integral part of their college program and also provides the means by which they may contribute substantially to the financing of their education. The Plan has been extended to the graduate level in engineering, actuarial science, rehabilitation administration, professional accounting, business administration, and law.

In the field of adult education, programs of study have been developed to meet a variety of needs. University College offers evening courses — offered by the University since 1906 — and adult-day courses leading to the bachelor's degree. In addition to offering day undergraduate programs in Electrical Engineering Technology and Mechanical Engineering Technology, Lincoln College offers evening/part-time certificate, associate, and bachelor degree programs in technological areas. All formal courses of study leading to degrees through part-time programs are approved by the Basic College faculties concerned.

GRADUATE AND PROFESSIONAL SCHOOLS

The nine graduate and professional schools of the University offer day and evening programs leading to the degrees listed.

The Graduate School of Actuarial Science offers the degree of Master of Science in Actuarial Science.

The Graduate School of Arts and Sciences offers the degrees of Master of Arts, Master of Science, Master of Science in Health Science, Master of Public Administration, and Doctor of Philosophy.

The Graduate School of Boston-Bouvé College offers the degree of Master of Science.

The Graduate School of Business Administration offers the degree of Master of Business Administration.

The Graduate School of Criminal Justice offers the degree of Master of Science.

The Graduate School of Education offers the degree of Master of Education and the Certificate of Advanced Graduate Study.

The Graduate School of Engineering offers the degrees of Master of Science, Engineer degree, Doctor of Engineering, and Doctor of Philosophy.

The School of Law offers the degree of Juris Doctor.

The Graduate School of Pharmacy and Allied Health Professions offers the degrees of Master of Science and Doctor of Philosophy.

The Graduate School of Professional Accounting offers the degree of Master of Science in Accounting.

CENTER FOR CONTINUING EDUCATION

The Center for Continuing Education was established in 1960 to relate the University to the needs of its community in a period of accelerated change. Adult education programs offered by the Center and University College have since been consolidated. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. The Division of Special Programs, working cooperatively with trade associations and professional societies, offers a wide variety of programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

RESEARCH ACTIVITIES

The facilities of the University are engaged in a wide variety of basic research projects in business, science, social science, pharmacy, and engineering. These are coordinated by the Dean of Research, whose services are University-wide and available to the faculties of all the Colleges.

Although Northeastern is primarily concerned with undergraduate and graduate instruction, the University believes that the most effective teaching and learning take place in an environment characterized by research activities directed toward extending the frontiers of knowledge

buildings and facilities

MAIN CAMPUS

The main campus of Northeastern University is located at 360 Huntington Avenue in the Back Bay section of Boston. Many of the city's famous cultural, educational, and philanthropic institutions are situated in the Back Bay, including the Museum of Fine Arts, Symphony Hall, Horticultural Hall, the Isabella Stewart Gardner Museum, the Harvard teaching hospitals, the Boston Public Library, and many schools and colleges. Most are within walking distance of Northeastern University.

Major transportation facilities serving the Boston area are Logan International Airport, two rail terminals, bus terminals serving inter- and intrastate lines, and MBTA subway-bus service within the metropolitan-suburban area. There is a subway stop in front of the campus. For motorists, the best routes to the campus are the Massachusetts Turnpike (Exit 22) and Route 9, of which Huntington Avenue is the intown section.

The campus of 47 acres is divided by Huntington Avenue, with the main educational buildings on one side and dormitories on the other. The principal buildings, all of which have been constructed since 1938, are of glazed brick in contemporary classic style. Most are interconnected by underground passageways.

Elli Student Center

The Carl S. Elli Student Center provides facilities for student recreation and for extracurricular activities. The Alumni Auditorium, with a seating capacity of 1,300, is part of the Center. Also included are special drama facilities, a ballroom, main lounge, fine arts exhibition area, student offices, conference rooms, and a dining area seating more than 1,000.

Libraries

The University library system consists of the Dodge Library, which is the main library; the Suburban Campus Library at Burlington; the School of Law Library; and divisional libraries for Physics and Electrical Engineering, Chemistry and Biology, Mathematics and Psychology, and Health, Physical and Recreation Education, and Physical Therapy. There are additional subject collections for the Center for Management Development at Andover, Massachusetts, and the Marine Science Institute in Nahant.

The library collections number 360,000 volumes supplemented by some 267,000 titles in microprint, microfilm, and microfiche forms. The collection includes, in addition, some 3,500 periodical titles, 90,000 documents, and 4,600 sound recordings.

Cabot Physical Education Center

The Godfrey Lowell Cabot Physical Education Center is one of the best equipped in New England. The large gymnasium contains four basketball courts. In addition, the Center consists of an athletic cage, a small gymnasium, and a rifle range, as well as administrative offices for the Department of Athletics and for the Physical Education Department of Boston-Bouvé College.

A recent addition to the center, the Barletta Natatorium, houses a 105-foot swimming pool, a practice tank for the crew, handball courts, and shower and dressing facilities.

Dockser Hall

Charles and Estelle Dockser Hall, completed in 1968, houses a large gymnasium, dance studio, motor performance laboratory, college library, community recreation laboratory, folk arts center, dark and music rooms, recreation resources area, locker rooms, offices, classrooms, conference room and lounge, storage facilities, and a research laboratory.

Apartments for Graduate Students

The University maintains a 100-apartment housing unit which accommodates 279 people. Two-, three-, and four-party apartments are available which vary in size from two to four rooms plus bath. Apartments are furnished with beds, chairs, desks, stove, refrigerator, and kitchen table. The cost includes all utilities.

A \$50 deposit is required when making application for the apartments. Applications are available in the Office of University Housing. Students are expected to make such arrangements on a term-to-term basis but may live in the apartments both while on cooperative work assignments and in school if they wish. All reservations are made on a first come, first served basis.

SUBURBAN FACILITIES

Suburban Campus

The Suburban Campus, located near the junction of Routes 128 and 3 in Burlington, Massachusetts, was established to meet the needs of individuals and of industry in the area.

In addition to graduate courses in engineering, physics, mathematics, business administration, science, education, and the arts, portions of undergraduate programs leading to the associate and bachelor's degrees, special programs for adults, and noncredit state-of-the-art programs are offered.

Warren Center

The Warren Center is a practical laboratory for Boston-Bouvé College in outdoor education and conservation, in group practicum, and in camping administration, programming, and counseling. At this Center in Ashland, completed in 1967, there are tennis courts, field hockey and lacrosse fields, waterfront for swimming and boating, overnight camp sites, fields and forests, heated cottages, the Hayden Lodge with a recreation hall, library, crafts shop, dining facilities, and conference accommodations.

Henderson House

The University's conference center, Henderson House, is located in Weston, Massachusetts. The Center for Continuing Education conducts short-term courses, seminars, and special institutes for business, professional, and research groups. Henderson House is 12 miles from the main campus.

Marine Science Institute

The Marine Science Institute at Nahant, Massachusetts, is a research and instructional facility primarily engaged in studies of marine biology and oceanography. The Institute is operated all year, and is about 20 miles northeast of Boston. Many of the courses at this institute are applicable toward an advanced degree in biology or health science.

Brockton, Nashua, and Framingham Campuses

For students residing in southeastern Massachusetts and northeastern Rhode Island, the Graduate School of Business Administration offers a major portion of its M.B.A. Program at facilities in Brockton, Massachusetts. These facilities, made available by the Veterans Administration Hospital, are conveniently located just off Route 24.

Students residing in the southern New Hampshire area may take a major portion of the M.B.A. Program at facilities in Nashua, New Hampshire. These facilities are furnished by Sanders Associates, Inc. and are located in their headquarters on Route 3, just over the Massachusetts line.

For students in the Framingham-Worcester area, a major portion of the M.B.A. Program may be taken at classroom facilities located in Framingham, Massachusetts.

the graduate school of education

The Graduate School of Education provides programs leading to the Master of Education degree for in-service educators who wish to pursue a specialization and for individuals who wish to pursue the special areas of study indicated below. A nondegree program for those who wish certification as elementary or secondary teachers is also offered.

Individuals who possess or are eligible for teaching certificates may earn the Master of Education degree in the areas of elementary or secondary school counseling, career education, curriculum and instruction, elementary and secondary administration, emotional disturbance, and mental retardation.

Those individuals who do not possess a teaching certificate may specialize in the areas of college counseling, community counseling, cooperative education, rehabilitation counseling, educational research, human development, instructional technology, occupational education, rehabilitation administration, speech pathology or audiology, and special education community personnel.

Programs of study leading to the Certificate of Advanced Graduate Study in the areas of counseling, educational administration, rehabilitation, and special education are offered to those individuals who presently hold a master's degree.

GENERAL REGULATIONS

The general regulations and minimum requirements for all graduate programs are established by the Northeastern University Graduate Council. In some matters the committee of each graduate school is allowed discretion to establish regulations within limits defined by the council. The regulations and academic requirements which follow have been formulated in accordance with this general policy.

Registration

Students must register within the period listed on the school calendar. Time and place of registration will be announced prior to each period.

Residence

All work for advanced degrees must be completed at the University unless approval has been obtained from the Director of the Graduate School for work taken elsewhere. Students who are in residence and are using the facilities of the University must register for such work.

Grading System

The performance of students in graduate courses will be recorded by the instructor by use of the following grades:

A Excellent

This grade is given to those students whose performance in the course has been of very high graduate caliber.

B Satisfactory

This grade is given to those students whose performance in the course has been at a satisfactory level.

C Fair

This grade is given to those students whose performance in the course is not at the level expected in graduate work.

F Failure

This grade is given to those students whose performance in the course is unsatisfactory.

In addition, the following letter designations are used:

I Incomplete

This grade is given to those students who fail to complete the work of the course.

S Satisfactory without quality designation.**U Unsatisfactory without quality designation.**

These two grades are used for the first quarter of a two-quarter sequence in which the grade for the second quarter applies to both the first and second quarters of the sequence.

The I grade will be changed to a letter grade upon removal of the deficiency which caused the grade of I to be reported. Deficiencies must be made up within the quarter following that for which the grade of I is received unless an extension of time is granted by the instructor. However, such extension of time may not exceed two additional consecutive calendar quarters.

Any student who wishes to take a final make-up examination must obtain permission of the Director of the Graduate School by the second week of the quarter succeeding that in which the examination was missed. The make-up examination must be taken in that succeeding quarter unless circumstances warrant permission of the Director to defer it to one of the next two quarters.

Class Hours and Credits

All credits are entered as quarter hours. A quarter hour of credit is equivalent to three-fourths of a semester hour credit. The academic calendar at the front of this bulletin should be consulted in order to determine the opening and closing dates of each quarter. It should be noted that most classes meet either in the late afternoon or evening.

Continuity of Program

Students are expected to maintain continuous progress toward a degree. Any student who has been admitted to a degree program, has completed at least one course, but has not attended for a period of one year, must notify the Office of the Graduate School of Education prior to additional registration. In addition, he must meet with his program adviser to make any necessary program adjustments.

Withdrawals

In order to withdraw from a course, a student must fill out an official withdrawal form obtained at the Registrar's Office or at the Burlington Campus Office. Withdrawals may be made through the ninth class meeting of the quarter. Students will be withdrawn as of the date on which they fill out the form. Ceasing to attend a class or notifying the instructor does not constitute an official withdrawal. See section on financial information for information on refunds.

Changes in Requirements

The continuing development of the graduate school forces frequent revision of curricula. In every new bulletin some improvements are indicated. When no hardship is imposed on the student because of changes, and when the facilities of the school permit, the student is expected to meet the requirements of the latest bulletin. If the student finds it impossible to meet these requirements, the bulletin for the year in which he entered becomes the binding one.

Application for the Degree

If a commencement card is not filed with the Registrar's Office on or before the applicable date listed on the calendar, there is no assurance that the degree will be granted in that particular year even though all other requirements have been fulfilled.

Honor Society

Northeastern University has on campus an active chapter of Kappa Delta Pi, a national honor society in education. Founded in 1911 at the University of Illinois, it invites individuals to become members "because of high records and an exhibited professional attitude which would enable one to grow in the field of education."

Graduate students must be degree candidates in the College of Education and have completed a major portion of work with a cumulative average of at least 3.5 out of 4.0, and have no C grades on their records.

Interested candidates may receive further information by writing: Dean of Education, Northeastern University, Boston, Massachusetts 02115.

Supporting Services

The College of Education operates or coordinates with other agencies in the operation of certain bureaus, clinics, and offices which support and enrich the academic programs. Graduate students may find some of these services to be of interest and assistance while others may be suggested as sources of information or practical experiences. Among these services are those discussed in the following paragraphs.

Northeastern University's Speech and Hearing Clinic, located in 133 Forsyth Building, provides diagnostic and therapeutic services for both University students and school-age community children insofar as staff and facilities allow. The Clinic is accredited by the Professional Services Board of the American Speech and Hearing Association.

The Instructional Materials Center (formerly the Curriculum Library), located in the Kennedy Building (104 The Fenway), contains a variety of materials and resources relating to a large number of programs and task areas of elementary and secondary schools. Use of this facility is limited to staff and students of the College of Education.

The Bureau of Educational Field Services, located in Cushing Hall (102 The Fenway), provides certain research and development as well as consultative services to school systems and other educational agencies on a contractual basis.

Northeastern University's Reading and Learning Clinic, located in Cushing Hall, provides diagnostic and corrective services in reading for both University students and school-age community children insofar as staff and facilities allow.

The New England Rehabilitation Research Institute, located in the United Realty Building, conducts rehabilitation studies on the problems of motivation and dependency and publishes reports pertaining to the area of rehabilitation. A materials resources library in rehabilitation research is housed in the same building as the Department of Rehabilitation and Special Education.

The Center for Educational Development, located in Cushing Hall, works with community agencies in developing and implementing innovative educational programs, particularly in areas which lack substantial financial resources, both urban and rural-isolated areas.

In addition, the College of Education utilizes the resources, materials, and facilities of other University-wide bureaus such as the Office of Educational Resources, an important component of which is the Center for Programmed Instruction.

financial information

FINANCIAL OBLIGATIONS

Tuition

Tuition for master's degree candidates, CAGS candidates and special students is \$45 per quarter hour of credit. There is a special tuition charge of \$450 for the following: 50.845-846, Research Internship I & II; 50.960, Practicum in Rehabilitation Administration; 51.805, Student Teaching; 51.873 and 51.875, Reading Clinic I & II; 53.805-806, Counseling Practicum; 53.840-841, Advanced Field Work; 55.813, Advanced Clinical Practice; 55.850-851, Student Teaching of the Emotionally Disturbed and Seminar; 55.852, Practicum; 55.853-854, Practicum and Seminar, 55.855-856, Student Teaching the Mentally Retarded and Seminar.

There is a special tuition charge of \$250 for the following: 52.843, Administrative Internship; Counselor Education Interns enrolled in the Boston School System.

Tuition statements are mailed to students by the Bursar's Office and are payable by check to Northeastern University on or before the date specified.

Tuition rates and fees are subject to revision by the Board of Trustees at any time.

Fees

An Application Fee of \$15 (nonrefundable) is charged all students when they apply for admission to the Graduate School of Education. No application papers will be processed until this fee has been received. Checks should be made payable to Northeastern University and sent to the Graduate School of Education, 102 The Fenway, Boston, Mass. 02115.

Other fees include a charge of \$10 for late payment of tuition; a fee of \$2 for deferred tuition (with approval of Bursar); a final examination make-up fee of \$5; a fee of \$25 for all degree candidates, payable before commencement by the applicable date listed on the academic calendar.

For full-time students there is a charge of \$12.50 per quarter for the

services available in the student center. The fee for teaching assistants and research fellows is \$6.25 each quarter. All part-time students on the Huntington Avenue campus are charged \$.75 a quarter.

All full-time students, including those with assistantships and fellowships, will pay a nonrefundable university health services fee of \$90 each year. This fee will provide Blue Cross-Blue Shield coverage and entitle the student to the medical care furnished by the University Health Service.

All financial obligations to the University must be discharged by graduation.

Refunds

Tuition refunds will be granted only on the basis of the date appearing on the official withdrawal form filed by the student. Nonattendance does not constitute official withdrawal. Questions regarding refunds should be discussed with the Bursar's Office.

Refunds will be granted in accordance with the following schedule:

Amount of Refund

Official Withdrawal Filed Within:	Percentage of Tuition
First week of quarter	100
Second week of quarter	75
Third week of quarter	50
Fourth week of quarter	25

FINANCIAL AID

There is a limited amount of financial aid available to graduate students. Information concerning scholarships and loan programs is available in the Office of Financial Aid.

Graduate Administrative Assistantships

Some University departments offer the graduate student an opportunity for remission of tuition and a stipend in return for half time spent in assisting with nonteaching, administrative duties. In all cases the student must register for a half-time academic load. It is assumed that applicants for such assistantships will be enrolled in a two-year program.

Tuition Assistantships

These appointments offer tuition waiver only. Graduate students given this type of appointment are assigned duties in the department requiring an average of 8 hours per week. They must register for a full-time academic load.

Teaching Assistantships

Graduate students given this type of appointment assist in the work of instructional departments or other offices of the University. The appointee may be assigned to class instruction, laboratory supervision, correcting papers and proctoring examinations. Including necessary preparation time, assigned duties require about 18 to 20 hours per week.

The student must register for a half-time academic load. It is assumed that applicants for such assistantships will be enrolled in a two-year program.

Traineeships

Graduate students given these appointments must devote full-time to graduate work in accordance with the stipulation of the appointment. These appointments are made from traineeships available from NASA, NSF, NDEA, and other government grants to the University. They may be for 9 to 12 months.

Martin Luther King, Jr., Scholarships

Established in 1969 in memory of the late Rev. Martin Luther King, Jr. Awards are made as openings occur to qualified minority graduate students who show financial need and are accepted to full-time study in the graduate schools of the University. Stipends will cover tuition and all fees.

Appointments

Appointments to fellowships and assistantships are ordinarily announced no later than April 15 for the following academic year or summer. Appointments are for a maximum of one year and are not automatically renewed. Students who hold assistantships are expected to devote full time to their studies and the duties of the award. They may not accept outside employment without the consent of their faculty adviser and the Director of the Graduate School.

Dormitory Proctorships

A number of proctorships in men's dormitories on or near the Huntington Avenue campus are available each year. Appointments carry a minimum compensation of room and board. Further information and application forms may be obtained from the Office of University Housing.

National Direct Student Loan

This program is available to students who are carrying at least one-half the normal academic workload, are accepted as degree candidates, and who show evidence of financial need.

The federal maximum which a graduate student may borrow while pursuing a post-baccalaureate degree is \$5000.

Repayment and interest on these loans do not begin until nine months after the student ceases to carry at least a half-time academic load at an institution of higher education. The repayment of principal may be extended over a ten-year period with the interest at the rate of 3 percent per annum. Repayment may be deferred up to a total of three years while a borrower is serving as a Peace Corps or VISTA volunteer.

Guaranteed Student Loan Program

Under this program, students who are matriculated degree candidates, enrolled for at least one-half the normal academic work load, may borrow from a participating bank or other financial institution. Terms and conditions vary from state to state, but a student generally may borrow up to \$1,500 a year (the law allows a maximum of \$2,500 per year) depending on financial need. The federal government pays the interest while the student is in school if the student is eligible for interest subsidy.

The student must have submitted, through the College Scholarship Service, a Parents' Confidential Statement; or if he has been declared financially independent by the Financial Aid Office, a Students' Confidential Statement. These forms are available in the Financial Aid Office.

Applications for the loan itself are available from local banks or the Education Office of your state government. Additional information and necessary application forms for Massachusetts residents are available from the Financial Aid Office.

Dr. Reubin J. Margolin Memorial Scholarship Fund

The Dr. Reubin J. Margolin Memorial Scholarship Fund was established in 1973 through the generosity of the family and friends of Dr. Reubin J. Margolin, an outstanding and dedicated individual and friend who, at the time of his death on April 6, 1972, was Chairman of the Department of Rehabilitation and Special Education at Northeastern University.

The income from the Dr. Reubin J. Margolin Memorial Scholarship Fund is awarded annually to a deserving student admitted to or enrolled in the College of Education or the Graduate School of Education and majoring in Rehabilitation and/or Special Education. Recipients must demonstrate financial need as well as the personal and professional qualities exemplified by Dr. Margolin.

faculty

- Arlis Aron, B.A., M.Ed., *Instructor in Speech Pathology and Audiology*
Joseph C. Aurelia, B.A., M.A., *Instructor in Speech Pathology and Audiology*
Robert E. Bachelder, B.S.Ed., M.A.Ed., Ed.D., *Lecturer in Education*
Ronald E. Baptiste, A.B., Ed.M., Ed.D., *Assistant Professor of Education*
Joseph E. Barbeau, B.S., M.Ed., Ed.D., *Associate Professor of Education*
Gloria D. Bernheim, B.A., M.A., Ph.D., *Assistant Professor of Education*
George W. Best, B.S., A.M., *Lecturer in Education*
Richard Brown, B.S., M.Ed., *Lecturer in Education*
Wendell R. Brown, B.A., LL.B., D.S.S., *Associate Professor of Education*
Nicholas J. Buffone, B.A., M.Ed., Ph.D., *Associate Professor of Education*
Leslie Burg, B.S., M.Ed., Ed.D., *Associate Professor of Education*
Robert S. Butters, A.B., M.Ed., Ed.D., *Associate Professor of Education*
Russell J. Call, B.Ed., M.A., Ed.D., *Associate Professor of Education & Director of Field Placement*
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Gregory C. Coffin, A.B., Ed.M., Ph.D., *Professor of Education*
Melvin E. Cohen, B.S., Ed.M., C.A.G.S., D.Ed., *Lecturer in Education*
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Thomas E. Cyrs, Jr., A.B., Ed.M., Ed.D., *Assistant Professor of Education and Director of Division of Instructional Systems Development*
Richard L. Dill, B.A., M.Ed., C.A.G.S., *Lecturer in Education*
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E. Lawrence Durham, A.B., M.A., *Professor of Education*
F. Andre Favat, A.B., Ed.M., Ed.D., *Associate Professor of Education*
Robert J. Ferullo, B.S.B.A., Ed.M., Ed.D., *Professor of Speech Pathology and Audiology, Director of Speech and Hearing Clinic*
William G. Freeman, B.A., Ed.M., C.A.S., *Lecturer in Education*
Gilbert C. Garland, B.S., Ed.M., Ed.D., *Professor of Education*
Mina B. Ghattas, B.A., M.Ed., Ph.D., *Associate Professor of Education and Director of Division of Instructional Media Systems*
Nancy C. Glock, A.B., *Assistant Professor of Education*
George J. Goldin, B.S., M.S., Ph.D., *Professor of Special Education*
Bonnie Greenberg, B.S., M.S., *Lecturer in Education*
E. Vaughn Gulo, A.B., M.A., Ed.D., *Associate Professor of Education*
Charles F. Haley, B.S., M.Ed., *Assistant Dean of Education*
Cheryl C. Hanks, A.B., A.M., *Assistant Professor of Education*
Thomas F. Harrington, B.A., M.Ed., Ph.D., *Professor of Education*
Thomas F. Henstock, B.A., M.A., Ed.M., Ed.D., *Assistant Professor of Education*
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Clinton T. Hilliard, B.A., M.A., *Lecturer in Education*
Fred Hinman, M.D., *Lecturer in Education*
Melvin Howards, B.S., M.A., Ph.D., *Professor of Education and Chairman, Department of Curriculum and Instruction*
Sherry R. Israel, B.A., M.A., Ph.D., *Lecturer in Education*
Maurice Kaufman, B.S., M.S., Ph.D., *Associate Professor of Education*

- Alvin Kent, B.A., M.Ed., Assistant Professor of Education and Director of Office of Educational Resources
Daniel C. Kielson, Ed.B., Ed.M., Ed.D., Lecturer in Education
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Louise LaFontaine, A.B., M.A., Ed.M., Assistant Professor of Special Education
Mary J. Lee, B.A., M.Ed., Associate Professor of Education
Marcus Lieberman, B.S., M.S., Ph.D., Lecturer in Education
Jerry E. Long, B.S., M.B.A., Lecturer in Education
Matthew H. Luzzi, B.A., M.Ed., C.A.G.S., Ed.D., Professor of Education and Acting Chairman, Department of Rehabilitation and Special Education
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Robert C. McLean, A.B., M.S., Ed.D., Associate Professor of Education
Joseph Meier, Ed.M., Ed.D., Associate Professor of Education
Harold A. Miner, B.S., Ed.M., Ed.D., Associate Professor of Education
Irene A. Nichols, B.S., Ed.M., Ed.D., Associate Professor of Education
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Judith D. Samuels, B.Ed., M.A., Lecturer in Education
Barbara Schram, B.A., M.A., M.S.W., Ed.D., Assistant Professor of Education
Harold F. Schuknecht, S.B., M.D., Lecturer in Education
James F. Scorzelli, B.S., M.A., Ph.D., Assistant Professor of Education
Madeline Shipsey, B.S., M.S., Lecturer in Education
Marilyn Spiegel, B.A., M.A., Lecturer in Education
Deanna Spielberg, A.B., M.Ed., Ed.D., Assistant Professor of Special Education
Kristine E. Strand, B.S., M.A., Instructor in Speech Pathology and Audiology
Lois E. Stryker, B.A., M.P.A., Lecturer in Education
Paul H. Tedesco, A.B., A.M., Ph.D., Associate Professor of Education
Benjamin Tessler, LL.B., M.Ed., Lecturer in Education
Gerald A. Tuttle, B.A., M.A., Ph.D., Assistant Professor of Speech Pathology and Audiology
Newton K. Von Sander, A.B., Ed.M., Ed.D., Lecturer in Education
Martin J. Wheeler, A.B., M.Ed., Lecturer in Education
James W. Wilson, B.S., M.A., Ph.D., Research Professor, Cooperative Education
Wesley G. Woll, B.S., M.D., Lecturer in Education
Alvin D. Zalinger, B.S., M.A., Associate Professor of Education

programs of the graduate school of education

MASTER OF EDUCATION

Professional Specializations

School Counseling Programs

- Elementary School Counseling
- Secondary School Counseling
- Career Education Specialist

College Counseling and Student Personnel Programs

- College Counseling
- Student Personnel
- Cooperative Education Coordinator

Community Mental Health and Rehabilitation Counseling Programs

- Community Mental Health Counseling
- Rehabilitation Counseling
- Community Services Counseling

Curriculum and Instruction

- English-Language Arts
- General Academic
- Reading
- Science-Mathematics
- Social Studies

Educational Administration

- Elementary and Secondary Administration
- Instructional Technology
- Occupational Education

Educational Research

Human Development

Rehabilitation Administration

Special Education

- Emotional Disturbance—Learning Disabilities
- Mental Retardation—Learning Disabilities
- Special Education Community Personnel

Speech Pathology and Audiology

- Audiology
- Speech Pathology

**Nondegree Program for Certification
of Elementary and Secondary Teachers**

CERTIFICATE OF ADVANCED GRADUATE STUDY (CAGS)

Counselor Education

Pupil Personnel Services Administration

Community Mental Health

Rehabilitation Counseling

Educational Administration

Cooperative Education

Educational Administration

Higher Education

Instructional Technology

Rehabilitation and Special Education Administration

MASTER OF EDUCATION DEGREE

Admission to Degree Candidacy

An applicant must have earned a bachelor's degree from an accredited institution and must complete all admissions procedures as described.

An applicant for graduate study in a master's degree program or a CAGS program (other than Counselor Education) should have on file in the office of the Graduate School of Education three weeks (two months for full-time) prior to the beginning of classes in any given quarter:

1. Two completed application forms.
2. Two official transcripts from all colleges or universities attended.
3. References as follows:
 - a. If no teaching experience, three letters of recommendation from individuals acquainted with the applicant's scholastic, professional, or intellectual ability.
 - b. If teaching experience (beyond student teaching), one reference from the current or most recent supervisor.
4. An official copy of the Miller Analogies Test score (MAT).
5. For CAGS applicants, a record of an interview with the chairman of the department to which they are applying.
6. For applicants whose native language is not English, an official copy of the results of the Test of English as a Foreign Language (TOEFL).

The Graduate School of Education may require a preadmission conference with any applicant. Applicants may at any time request a conference with the Director of the Graduate School of Education or his designate.

Application Fee

All applications for admission must be accompanied by an application fee (nonrefundable) of \$15. No application will be processed until the fee has been received by the Graduate School of Education. Checks should be made payable to Northeastern University and sent to the Graduate School of Education, 102 The Fenway.

Confirmation

Applicants must confirm their acceptance to a program within the designated period of time. If confirmations are not received, places in the program will be offered to other applicants.

Students who have confirmed their acceptance to a program but who have not initiated their programs within four quarters of admission will be withdrawn from the Graduate School of Education.

Full-time Study

A full-time student must take three courses in all quarters except the summer session, during which he must take a minimum of two courses. Enrollment in an additional course in any quarter must be approved by the adviser.

Part-time Study

A part-time student may enroll in a maximum of two courses in any given quarter.

Program Selection and Registration

Upon acceptance as a degree candidate, the student will be assigned an adviser in his major area of study. After notification of acceptance by the Graduate School of Education, the student must confer with the adviser regarding his program of studies and initial course registration. The student's initial program and any subsequent changes may develop only as a result of the written recommendation of the adviser.

Initial registration will be allowed only upon presentation of a "Permit to Register" card.

Special Student Status

Applicants who have earned a bachelor's degree from an accredited institution and who acknowledge that they do not wish to pursue a degree may be accepted as special students. Special students may register for a maximum of three courses, one per quarter, provided that they submit an application form, accompanied by an application fee of \$15, and an official transcript, three weeks prior to the beginning of classes. Academic credit earned in such study may not be used to fulfill degree requirements in the Graduate School of Education unless the applicant is accepted as a degree candidate and the courses are applicable to his program. Special students may be considered for degree candidacy only upon full presentation of application materials and a formal petition to the Director of the Graduate School of Education.

Academic Classification

1. *Regular* Applicants who meet in full the criteria for immediate matriculation are classified as regular students.
2. *Provisional* Some applicants who do not meet regular admissions standards may be admitted as provisional students. Such students must maintain a B average in their first twelve quarter hours of work in order to continue in the graduate program. Provisional students admitted for part-time study may take only one course in their first quarter of study.
3. *Special* See above.

Programs of Study

The curricula of the programs for the Master of Education degree are given on pages 41-46.

Programs are available for students with or without regular teaching certification. Those with certification may major in the professional specializations listed on page 40.

Students without certification must pursue a Master of Education degree program for which certification is not mandatory (as indicated on page 40).

A nondegree certification program for elementary and secondary teachers is available as described on pages 65 and 66.

Comprehensive Examination

A comprehensive examination may be required by a department. Unsatisfactory performance in such an examination constitutes grounds for withholding the degree.

Academic Requirements

In order to qualify for the Master's Degree in Education, an average grade of B must be obtained in all courses. No additional course credits may be allowed in order to satisfy the B average required for the degree.

No student who receives a grade of less than B in three or more courses will be permitted to continue in the program. A student who has accumulated two grades of C from the same faculty member may not register for a third course with this faculty member.

A student who receives a grade of F in a course must make up the course in accordance with the recommendation of his adviser. A student who receives a grade of F in two courses will not be permitted to continue in the program.

Credit and Course Requirements

In satisfying the requirement for a minimum of 40 quarter hours, a student's program must include at least 12 courses which apply to the degree.

Transfer Credits

A maximum of 12 quarter hours of credit obtained at another institution may be accepted toward the master's degree provided that the credits are recommended for transfer by the student's adviser, consist of work taken at the graduate level for graduate credit, carry grades of A or B, have been earned at an accredited institution, and have not been used toward any other degree. Students should petition the Director of the Graduate School in writing for all transfer credit by completing the necessary form, obtainable from either the office of the Graduate School of Education or the faculty adviser. The completed form must be

submitted to the Director of the Graduate School of Education along with an official transcript and an excerpt from the catalog describing the course. No transfer form will be considered complete without the signature of the student's adviser or department chairman. Grades on transfer credits may not be used for the purpose of obtaining the academic average necessary for completion of the degree requirements.

Time Limitations

Course credits earned in the program of graduate study, or accepted by transfer, are valid for a maximum of seven years.

NONDEGREE PROGRAM FOR CERTIFICATION OF ELEMENTARY AND SECONDARY TEACHERS

Admission

Applicants for this program must follow the admissions procedures as described on page 35 and meet the admissions requirements for the Master of Education degree. In addition, applicants must have had a course in either child or adolescent psychology (or take such a course as a fourth course requirement in the Graduate School of Education). Candidates for secondary certification must have completed, before admission, at least 36 quarter hours of courses in the field in which they are preparing to teach, with a QPA for all courses taken in that field of at least 2.000.

Academic Requirements

In order to qualify for Student Teaching, students must have completed the three required courses with a B average, and be recommended by their major adviser.

A student may repeat a course in which he has received a grade of C or F, and the second grade will govern. However, only one course may be repeated on this basis.

CERTIFICATE OF ADVANCED GRADUATE STUDY (CAGS) PROGRAM

Admission

An applicant for the Certificate of Advanced Graduate Study in Counselor Education, Educational Administration, and Rehabilitation and Special Education must hold a master's degree from an accredited institution and file supportive materials in accordance with guidelines which will be provided upon request. Inquiry, specifying the program for which information is sought, should be addressed to the Director of the Graduate School of Education.

Counselor Education CAGS students are accepted once a year, between April 1 and November 1. All application materials must be com-

pleted by September 15, or the candidate's application will automatically be forwarded for inclusion in the next action period. Within this period candidates will be informed of their admission status as soon as possible after all application credentials are completed, but no later than the start of the registration period for the next quarter.

Applicants for CAGS programs in areas other than Counselor Education must have application materials on file in the office of the Graduate School of Education three weeks (two months for full-time) prior to the beginning of classes in any given quarter.

Academic Requirements

In order to qualify for the Certificate of Advanced Graduate Study, an average grade of B must be obtained in all courses. No additional course credits may be allowed in order to satisfy the B average required for the certificate.

No student who receives a grade of less than B in three or more courses will be permitted to continue in the program. A student who has accumulated two grades of C from the same faculty member may not register for a third course with this faculty member.

A student who receives a grade of F in a course must make up the course in accordance with the recommendation of his adviser. A student who receives a grade of F in two courses will not be permitted to continue in the program.

Transfer Credits

See requirements under master's degree on preceding pages.

Time Limitations

Course credits earned in the program of graduate study, or accepted by transfer, are valid for a maximum of seven years.

Qualifying and Comprehensive Examinations

Students may be required to take a qualifying examination. All students are required to satisfactorily complete a comprehensive examination in order to qualify for the Certificate of Advanced Graduate Study.

fields of study

PROGRAMS IN PROFESSIONAL SPECIALIZATIONS

Master of Education

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*Teaching certification not mandatory.

All students must complete one of the programs as outlined below. In most cases, the sequence is designed to be very flexible. Any variations or changes must have the prior recommendation of the major adviser and approval of the Director of the Graduate School of Education.

MASTER OF EDUCATION CORE REQUIREMENT

Required of all candidates:

Area I — Research

50.815 Research Design in Education

Entrance into this course must be preceded by satisfactory completion of a proficiency examination in statistics administered by the Center for Programmed Instruction or by satisfactory completion of 50.841 Introduction to Educational Statistics. **Important:** 50.815 must be included among the first six courses taken by each student.

All candidates must complete at least one course in each of two of the following areas:

Area II — Psychological Foundations

50.803 Child Psychology

50.804 Adolescent Psychology

These two courses are intended for students with no previous background in psychology.

50.806 Psychology of Learning

50.810 Psychology of Personality

50.811 Psychology of Cognition

It is strongly recommended that entrance into any of these courses be preceded by a course in psychology.

50.808 Seminar in Child Development

Entrance into this course *must* be preceded by a course in child psychology or human development.

50.809 Seminar in Adolescent Development

Entrance into this course *must* be preceded by a course in adolescent psychology or human development.

50.850 Communications Theory

Area III — Social Foundations

- 50.801 Educational Anthropology
50.802 Sociology of Education

These two courses are intended for students with no previous background in sociology and anthropology.

- 50.805 Personality and Social Structure

It is strongly recommended that entrance into this course be preceded by a course in sociology, cultural anthropology, or social psychology.

- 50.820 Seminar in Contemporary Issues in American Education

Area IV — Humanistic Foundations

- 50.812 History of Education
50.813 Philosophy of Education
50.818 Comparative Education

PROGRAMS**Counselor Education***General Information*

The Department of Counselor Education offers several program options within three major program clusters: School Counseling, College Counseling and Student Personnel, and Community Mental Health and Rehabilitation Counseling. Each of the options in these clusters is described on the following pages. Prospective students must apply to a specific cluster program or a specific emphasis within a cluster.

The master's degree requirements can be completed by full-time students in four quarters or one calendar year. However, the Department considers these programs to be minimal and urges most students to take an additional year of study leading to the C.A.G.S.

Part-time students entering any of the programs should be aware that the practicum sequence (53.805-53.806), including the concurrently required counseling course (53.804), is only offered on a sequential basis beginning in the Fall Quarter. Part-time students may not begin this sequence until their second year of study. Applications must be made and approved in advance for the practicum.

Full-time students in Counselor Education Programs will be accepted once a year beginning April 1, with a deadline of July 1 for completion of admission requirements. Part-time students will be admitted between April 1 and November 1, with the deadline for completing admissions requirements September 15. All students should apply for programs to begin in the Summer or Fall Quarters only. Early application is encouraged since there is limited enrollment and all spaces may be taken before the above deadlines for filing application materials.

Internships — Financial Aid

No financial aid in the form of scholarships or grants is available to students through the Department. Students should consult the Financial Aid Office of the University for information as to what is available to graduate students. However, the Department does try to develop paid Internships in various work settings as both a means to ease the financial burden and to provide a more extensive work experience. The numbers of internships are limited, and they are not necessarily available in all programs. Their availability is entirely dependent on the interest and ability of schools or agencies to make money available for an internship position.

The opportunity for professional development makes the Internship especially attractive, and any interested student is encouraged to apply. No placements can be guaranteed, however. Applications for internships and additional information are available from the Department of Counselor Education or from the Graduate School Admissions Office.

Core Curriculum Requirements

In addition to three Foundations of Education core requirements described on pages 41 and 42, all programs in the Department have a common core of required courses as follows:

- 53.800 Foundations of Guidance and Human Services
- 53.801 Tests and Test Procedures
- 53.804 Counseling Theory and Process
- 53.805-53.806 Counseling Practicum

The Counseling Practicum is always specific to the particular program to which the student has been admitted. These core requirements constitute eight of the twelve courses required for the master's degree. The program descriptions that follow will specify the remaining four required and elective courses and identify recommended Foundations of Education core requirements.

School Counseling Programs*

Program options in this cluster include preparation for positions in elementary school counseling, secondary school counseling, and career education guidance work.

The Elementary School Counseling Program prepares students to: 1) help children to grow in self-understanding and in positive fuller use of potential; 2) help parents to understand the developmental needs of

* Massachusetts certification requirements for guidance counselors will change as of July 1, 1975, to make it possible for students without teaching certificates to become certified through our program as guidance counselors. While teacher preparation is desirable, it is not required for acceptance into this program.

all pupils and work with parents to meet the individual needs of their own children in the school situation; 3) participate in creating a school environment conducive to learning and growth for all children; and 4) participate in curriculum development and change. The training focuses on developing competencies in individual counseling, group counseling, consulting, testing, and parent counseling. Students are prepared to work with children, parents, and teachers in schools and related settings.

Elementary Counseling Practicum placements are made in a variety of urban and suburban elementary schools and in child guidance clinics.

The Secondary School Counseling Program assumes that there are things which the school counselor can do to make the school a better place in which to learn and to teach. Various ways in which the guidance person can work with pupils, parents, teachers, administrators, and community agencies as a counselor, as a consultant, and as a coordinator are emphasized. The focus of the program is on the practical background knowledge and the specific skills the counselor needs for helping students to learn more effectively, to make decisions more maturely, and to achieve personal fulfillment more completely.

Secondary Counseling practicum placements are made in a variety of urban and suburban secondary schools and school outreach programs.

The Career Education Program is designed to prepare students for a variety of counselor-type roles within the career education orientation. These newly emerging roles within the broad field of career education encompass three specific dimensions of training: 1) the organization and utilization of career information as a resource, 2) the development of job placement — job counseling skills, and 3) the innovation of appropriate curriculum practices and revisions. The program is designed so that at the practicum phase of their training students can be placed in field settings where they can obtain actual experience in all three of these dimensions of career education. This program is intended for students who have experience and/or an interest in working with school age youth — grades kindergarten to twelve — in the area of career development and work placement.

Career Education Specialist Practicum placements are made in both comprehensive and vocational-technical schools where there is an emphasis on career education and/or work-study type programs. Insofar as possible placements will provide an opportunity for working on a K-12 basis.

Sample Program (Elementary emphasis)*

53.810 Elementary School Guidance

* All sample programs list only the courses that are in addition to the five basic departmental requirements specified on page 44. The student's actual program will be individually planned and may vary from the sample program given in the catalog.

- 53.813 School Counseling Strategies
- 53.824 Individual Intelligence Testing
- 50.815 Research Design in Education
- 50.808 Seminar in Child Development
- 50.805 Personality and Social Structure
- 53.808 Group Counseling
or
- 53.811 Family and Parent Counseling
or
- 55.807 Learning Disabilities

Sample Program (Secondary emphasis)

- 53.802 Vocational Development and Occupational Information
- 53.808 Group Counseling
- 53.813 School Counseling Strategies
- 53.807 Administration of Guidance Services
- 50.815 Research Design in Education
- 50.802 Sociology of Education
- 50.809 Seminar in Adolescent Development

Sample Program (Career Education emphasis)

- 53.802 Vocational Development and Occupational Information
- 53.814 Vocational Counseling Strategies
- 52.816 Seminar in Career Education
- 53.807 Administration of Guidance Services
- 50.815 Research Design in Education
- 50.802 Sociology of Education
- 50.809 Seminar in Adolescent Development

College Counseling and Student Personnel Programs

Program options in this cluster include preparation for positions in college counseling centers, student personnel positions, and positions in cooperative education programs in higher education.

Preparation for both college counseling and student personnel positions is similar and based on the assumption that the student personnel worker must have the human relations skills of the counselor, and the counselor must have an understanding of both the learning development needs of students and the instructional environment of the college setting. Graduates will have a basic knowledge of vocational development and career planning, information-gathering, interviewing techniques, decision-making strategies, and group process. Students may then choose to emphasize the counseling role in the counseling center or the student personnel role which is more programmatic within the institution. Practicum placements can be varied to suit individual interests. Positions for graduates may include counseling in junior colleges

or residence halls; counseling in financial aid, student activities, or admissions offices; or that of assistant to a dean of students.

College Counseling and Student Personnel Practicum placements are made in a variety of junior college, college, and university settings in the Greater Boston area. In addition to counseling center placements, there are placements in residence halls, financial aids offices, and other student personnel program offices. Placements are also made in such higher education related settings as the Center for Alternative Education, a personal development program.

The rapid expansion of cooperative education programs in higher education throughout the United States has increased the need for trained persons to staff the centers that coordinate and operate these programs. Northeastern University is the largest cooperative education institution in the world and as such, can provide an excellent opportunity for the student interested in this aspect of higher education. At the master's level the preparation emphasizes a counseling base because the coordinator's prime role involves student contact. The three major elements in the coordinator's role are 1) vocational decision-making counseling, 2) work placement and work evaluation, and 3) curriculum development within the institution. The coordinative function involves providing links between the student and his educational program and the employer and his work setting. These two elements are combined to produce a total educational experience for the student. Preparation beyond the master's degree can lead to careers in either student personnel, counseling, higher education administration, or cooperative education administration.

Cooperative Education Coordinator placements will be made in the Division of Cooperative Education, Northeastern University, and in other colleges and junior colleges in the area that have or are developing cooperative education programs.

Sample Program (College Counseling emphasis)

- 53.808 Group Counseling
- 53.809 The College Student and His Campus
- 53.816 Psychological Counseling Strategies
- 53.814 Vocational Counseling Strategies
- 50.815 Research Design in Education
- 50.805 Personality and Social Structure
- 50.810 Psychology of Personality

Sample Program (Student Personnel emphasis)

- 53.809 The College Student and His Campus
- 53.814 Vocational Counseling Strategies
- 53.812 Seminar in Student Personnel Work
- 53.864 Typologies of Higher Education
- 50.815 Research Design in Education

- 50.809 Seminar in Adolescent Development
- 50.805 Personality and Social Structure

Sample Program (Cooperative Education emphasis)

- 53.809 The College Student and His Campus
- 53.802 Vocational Development and Occupational Information
- 53.814 Vocational Counseling Strategies
- 52.824 Administration of Cooperative Education
- 50.815 Research Design in Education
- 50.802 Sociology of Education
- 50.806 Psychology of Learning

Community Mental Health and Rehabilitation Counseling

Program options in this cluster enable the student to prepare for positions in rehabilitation counseling and a variety of community-based counseling agencies including mental health centers and employment security offices.

The Rehabilitation Counseling option is designed to prepare students to deliver comprehensive services to disabled and handicapped populations with the ultimate objective of improving the nature of their social, family, and personal functioning. The population to be served includes the physically handicapped, mentally ill, mentally retarded, alcohol and drug addicted, chronically dependent, and penal offenders. Graduates of this program will be generally familiar with the nature of physical, mental, and social handicaps; with the existing rehabilitative services through work experiences, field visits, reading, and discussions with agency personnel; with the elements of rehabilitation operations, including systematic evaluation, individual counseling, planning for additional needed examinations and services, planning for training, vocational planning and placement, and follow-up services in the community.

Rehabilitation Counseling practicum placements are made in community workshops for the physically handicapped, mentally ill, mentally retarded; workshops and half-way houses for drug addicts, alcoholics, and penal offenders; rehabilitation centers in mental hospitals, schools for mentally retarded, and correctional institutions; rehabilitation programs for dependent persons in the welfare department and in the Division of Employment Security; and rehabilitation programs and departments in community mental health centers.

The Community Mental Health Counseling option is designed to prepare students to assist in the delivery of comprehensive mental health and allied counseling services to individuals, families, and groups experiencing personal, career, and social problems. Graduates will be introduced to the major approaches to individual, group, marriage, and family counseling. They will have some knowledge of important environmental effects on the behavior of various client populations. Be-



cause of the comprehensive nature of the community mental health field, students seeking admission to this program should give serious consideration to a two-year commitment or its equivalent leading to the completion of a Certificate of Advanced Graduate Study.

Community Mental Health Counseling practicum placements are made in out-patient clinics, in-patient facilities, community mental health centers, city hospitals having family counseling services, state mental hospitals, drop-in centers, career planning agencies, adolescent counseling programs, street-work and out-reach counseling programs.

An option within the above program, requiring two years for completion, is offered in cooperation with the Massachusetts General Hospital Eric Lindemann Mental Health Center. Applicants for this program should specify this preference on their application materials (MGH/ELMHC Option). At the same time the applicant should request a separate set of application materials from Dr. Sherry Autor, Bullfinch Center, Massachusetts General Hospital. This option provides for an extensive practicum over the two year period. Certain of the above courses listed as electives will be required for students in this option. Further information may be obtained from Dr. Autor.

The Community Services option is designed to prepare students to work in a variety of human services agencies providing adjustment, informational, supportive, and recreational services for broad segments of the population regarded as behaving normally. Much of the work could be categorized as preventive community mental health. Graduates will have a basic knowledge of vocational development and career planning, information-gathering, interviewing techniques, and decision-making strategies. They will have a knowledge of psychometrics, adolescent and adult personality development, procedures in educational and vocational placement, and the utilization of multiple helping agencies in meeting clients' needs. They will have skills in individual and small group counseling.

Community Services Counseling Practicum placements include state offices of the Division of Employment Security, Manpower Training Programs, Model Cities Programs, YMCA, YWCA, Boys' Clubs, Girls' Clubs, recreational facilities, community centers, drop-in centers, Youth Activities Commission, and career planning agencies.

Sample Program (Rehabilitation emphasis)

- 53.815 Rehabilitation Counseling Strategies
- 50.950 Introduction to Rehabilitation
- 50.951 Principles of Medical Rehabilitation
- 50.965 Occupational Placement
- 50.815 Research Design in Education
- 50.805 Personality and Social Structure
- 50.810 Psychology of Personality

Sample Program (Mental Health emphasis)

- 53.811 Family and Parent Counseling
- 53.816 Psychological Counseling Strategies
- 53.831 Advanced Group Counseling
- 50.956 Community Planning in Rehabilitation
- 50.815 Research Design in Education
- 50.805 Personality and Social Structure
- 50.807 Abnormal Psychology

Sample Program (Community Services emphasis)

- 53.802 Vocational Development and Occupational Information
- 53.814 Vocational Counseling Strategies
- 50.950 Introduction to Rehabilitation
- 50.956 Community Planning in Rehabilitation
- 50.815 Research Design in Education
- 50.805 Personality and Social Structure
- 50.809 Seminar in Adolescent Development

Curriculum and Instruction (Including Programs in Reading)

The programs in Curriculum and Instruction are appropriate for certified or experienced teachers who wish to prepare for instructional leadership and curriculum development responsibilities, who wish to enlarge their professional backgrounds in subject matter or pedagogy, or who wish to achieve reading certification.

This program will enable its graduates:

- (1) to view the educational process as an ongoing activity embodying both continuity in each of its parts and inter-relatedness among its parts;
- (2) to plan and institute learning activities which promote continuity and inter-relatedness;
- (3) to evaluate and modify appropriately existing programs and practices in their special fields;
- (4) to identify educational needs, analyze them, and develop suitable plans to meet them;
- (5) to institute desired changes in educational practice.

The following roles are seen as some of those for which graduates of the program will be prepared:

- (1) specialist in a particular content area, such as reading, mathematics, science, social studies, English-language arts, at one or more levels — elementary, secondary, or adult education;
- (2) curriculum specialist in a variety of educational settings;
- (3) instructional specialist such as team leader, conductor of workshops, master teacher, and so forth, in a school or other educational setting.

The Master of Education in Curriculum and Instruction is divided into four basic areas of study:

1. Master of Education Core

2. Curriculum and Instruction Core

The Curriculum and Instruction Core consists of two sequential courses which individually and together emphasize a unitary view of the processes of curriculum development and instructional practices at all levels of education and in all school subjects. The Curriculum and Instruction Core is taught jointly by members of the Department, and students have the unique opportunity of studying with a wide range of faculty, each contributing his individual expertise and perspective within the context of the common purpose.

3. Specialization

A specialization consists of a number of courses constructed around a broad area through which students can pursue their specific interests while at the same time keeping sight of larger contexts. The courses are taught jointly by members of the Department of Curriculum and Instruction, grouped according to the commonalities among their subjects, thus giving students the opportunity to work within a context which, while recognizing the discreteness of a subject, at the same time encourages recognition of what this subject shares with its fellows in its area.

Students will normally select one area of specialization from those listed below, depending upon their background and interests. Students whose interests lie outside the above areas will be permitted to design, with their advisers, a program to meet their needs. Students seeking reading certification will fulfill the state requirements by completing the courses in the Reading specialization.

4. Electives

The elective portion of the Curriculum and Instruction Program will enable students to pursue other areas of interest which will complement or extend their area of specialization. Electives can be selected broadly from the offerings of the Graduate Schools of the University.

*Specimen Programs***Master of Education Core**

Three courses as defined on pages 42 and 43.

Curriculum and Instruction Core

51.880 Evolution and Revolution in the School Curriculum

51.881 The Dynamics of Innovation in Curriculum and Instruction

Specializations**Science-Mathematics**

51.837 Curriculum Problems in Science and Mathematics

51.838 Seminar in Science and Mathematics Teaching

51.839 Implementing Change in Science and Mathematics Education

Electives (four to be approved by adviser)

or

Social Studies

51.851 Seminar in Current Issues in the Social Studies

51.853 History and the Social Sciences in the School Curriculum

51.854 Social Science Materials Seminar

Electives (four to be approved by adviser)

or

English-Language Arts

51.870 Developmental Reading and Writing

51.871 Reading and Language Disabilities I

51.872 Literature and Materials Seminar

Electives (four to be approved by adviser)

or

Reading

51.870 Developmental Reading and Writing

51.871 Reading and Language Disabilities I

51.872 Literature and Materials Seminar

51.873 Reading Clinic I

51.874 Reading and Language Disabilities II

51.875 Reading Clinic II

Elective (one to be approved by adviser)

or

General Academic

51.870 Developmental Reading and Writing

51.871 Reading and Language Disabilities I

51.837 Curriculum Problems in Science and Mathematics Education

- 51.838 Seminar in Science and Mathematics Teaching
 51.853 History and the Social Sciences in the School Curriculum
 51.854 Social Science Materials Seminar
 Elective (one to be approved by adviser)

or

Other Purposes

A student who wishes to specialize in curriculum and instruction in a field not included in those listed above should make an appointment with an adviser for this program who will help him develop an appropriate course of study by drawing on courses offered throughout the Graduate Schools of the University.

Each candidate's program must be approved by his faculty adviser before he begins his course of study. A student admitted to special student status who feels he may eventually wish to be admitted to degree candidacy must consult with an appropriate faculty adviser before he enrolls in any course.

Educational Administration

In the field of educational administration, three distinct programs are provided at the master's degree level. These programs are in the areas of elementary and secondary school administration, instructional technology, and occupational education.

Elementary and Secondary Administration

This program is designed to prepare the student for initial entry into the field of educational administration, preparing him for such beginning positions as assistant principal, principal of a small school, department chairman, special program director, or beginning administrator in allied fields as well as to serve as a foundation for further graduate study. A typical program is as follows:

Master of Education Core (required of all candidates)

Three courses as defined on pages 42 and 43.

Educational Administration Requirements

- 52.810 Leadership in Education: Part I
 52.811 Leadership in Education: Part II

Departmental Program of Study

- 52.813 Instructional Leadership: Curriculum Development and Supervision
 52.805 Simulated Problems: Secondary School Administration
 or
 52.814 Simulated Problems: Elementary School Administration
 52.806 Directed Field Experiences in the Administration of the Elementary School
 52.807 Directed Field Experiences in the Administration of the Secondary School

- 52.808 Seminar in Educational Administration
- 52.826 Administration of the Elementary School
and/or
- 52.827 Administration of the Secondary School
Elective (to be approved by adviser)

Upon completion of the above program, a comprehensive examination is given to each student.

Instructional Technology

In recent years considerable growth and expansion has taken place in the area of technology for instructional purposes. With this thought in mind, the master's degree in this field has been created. It is aimed at formally preparing students to serve effectively as directors of such programs in schools, colleges, government, and industrial settings. Students completing this program are certifiable as audiovisual media specialists in the public schools.

A typical program:

Master of Education Core (required of all candidates)
Three courses as defined on pages 42 and 43.

Educational Administration Required Courses (3)

- 52.810 Leadership in Education: Part I
- 52.811 Leadership in Education: Part II
- 52.813 Instructional Leadership: Curriculum Development and Supervision

Instructional Technology Required Courses (5)

- 52.822 Foundations of Instructional Communications and Technology
- 52.823 Principles of Instructional Systems Development
- 52.817 Design, Production, and Utilization of Instructional Materials
- 52.818 Developing Curriculum Learning Packages
- 52.821 Administration of Instructional Media Programs

Those seeking certification as Audiovisual Media Specialists must also enroll in 52.847 Cataloguing and Classification of Instructional Materials.

Upon completion of the above program, a comprehensive examination is given to each student.

Occupational Education

This program of study is designed to equip prospective administrators and supervisors of occupational education with understandings, skills, and technical competencies which will enable them to assume and

perform leadership functions in such positions as coordinators, supervisors, or directors of occupational education in regular or comprehensive secondary schools, specialized vocational schools, community colleges, or at the state level. Satisfactory completion of an oral conference and a written comprehensive examination is also a requirement of this program.

Master of Education Core (required of all candidates)

Three courses as outlined on pages 42 and 43.

Educational Administration Requirements (4)

52.810 Leadership in Education Part I

52.811 Leadership in Education Part II

52.813 Instructional Leadership: Curriculum Development and Supervision

52.826 Administration of the Elementary School
or

52.827 Administration of the Secondary School

Departmental Program of Studies in Occupational Education (5)

52.806 Directed Field Experiences in the Administration of the Elementary School

52.807 Directed Field Experiences in the Administration of the Secondary School

52.815 Simulated Problems: Administration of Occupational Education

52.816 Seminar in Career Education

52.843 Internship—other appropriate occupational electives from the Graduate School of Education.

Educational Research

This program is designed to train educational researchers who will have: 1) an understanding of the nature and characteristics of research as it is carried on in educational research agencies; 2) a basic knowledge of research methodology and related theory that will enable them to assist at all stages of educational research; and 3) the technical skill to carry out independently the operational aspect of educational research.

The objectives stated above and the related competences are achieved through an integrated program of study. This program may be taken on a full- or part-time basis, and study may begin in any quarter. A full-time student will normally complete degree requirements in one academic or calendar year (three or four quarters). The culminating component of the program is the planning, executing, and writing up of research for a thesis, intended as a small-scale but original investigation into a significant educational problem. The thesis may be presented in one of several formats selected jointly by the student and the adviser.

All candidates will be required to complete the following program:

Master of Education Core (required of all candidates)**50.815 Research Design in Education (Area I)**

Two courses from the remaining areas as described on pages 42 and 43.

Educational Research Requirements**50.841 Introduction to Educational Statistics****50.842 Intermediate Educational Statistics****50.817 Research Problems in Education****50.847 Introduction to Computer Programming: FORTRAN IV****50.891 Thesis (equivalent to two courses)****Electives (three)****Human Development**

The overall objective of this program is to provide opportunities for practicing and prospective educators to expand and deepen their knowledge and understanding of human development in its psychological and social aspects. Completion of the program does not lead to state certification, and a teaching certificate is not required for admission to the program. However, the program can provide a useful background for persons teaching, or planning to teach, psychology and behavioral science in secondary and elementary schools. It can also serve as introductory preparation for students who aspire to later doctoral study in the field of human development. Full-time students will take a maximum of four courses per term and will complete the program in a minimum of three quarters. Part-time students will take a maximum of two courses per term and will complete the program in a minimum of six quarters.

Candidates may begin study in any quarter and will be required to complete the following program:

Master of Education Core (required of all candidates)**50.815 Research Design in Education**

Two additional courses, one from Area III (Social Foundations) and one from Area IV (Humanistic Foundations).

Human Development Requirements**50.806 Psychology of Learning****or****50.811 Psychology of Cognition****50.810 Psychology of Personality****or****50.805 Personality and Social Structure (if not taken in EdM Core, above)****50.808 Seminar in Child Development****50.809 Seminar in Adolescent Development****50.819 Theories of Developmental Psychology**

Electives (choice of courses or thesis):

Courses: four courses, chosen in consultation with an adviser, from those offered in the Graduate School of Education and other departments in the University

- Thesis: 50.817 Research Problems in Education
50.842 Intermediate Educational Statistics
50.891 Thesis (equivalent to two courses)

Rehabilitation Administration and Special Education*Rehabilitation Administration*

This program is designed to prepare students for positions of administrative leadership and research in a wide range of rehabilitation and health care service agencies.

Students majoring in Rehabilitation Administration should anticipate taking 15 credit courses for the degree under either of the following options:

Plan A: For students with limited rehabilitation or administration experience.

The program will be conducted on a cooperative education basis. This means that the student will alternate periods of academic course work with paid practical experience in the field over a 21-month period.

Plan B: For students with considerable rehabilitation or administration experience.

The program takes one calendar year from September through August and includes four academic quarters. During this time the student also completes 500 hours of practical experience in the field. Under Plan B there are a limited number of federal stipends available which are issued on a competitive basis.

Plan C: For students with limited rehabilitation or administration experience who wish an alternative plan to cooperative education.

The program will take a minimum of two calendar years. During that time the student will elect his academic course work, 500 hours of practical field work experience, and a full-time internship experience.

Recommended Core Courses

- 50.805 Personality and Social Structure
50.807 Abnormal Psychology

Department Requirements

- 50.950 Introduction to Rehabilitation
50.951 Principles of Medical Rehabilitation
50.952 Rehabilitation and Social Services
50.953 Organization and Administrative Theory

- 50.961 Rehabilitation Administration I
- 50.963 Rehabilitation Administration II
- 55.832 Group Dynamics
- 50.960 Practicum in Rehabilitation Administration
- 50.956 Community Planning in Rehabilitation

Electives chosen from

- 50.957 Federal-State Relations in Rehabilitation
- 50.958 Social Welfare and Rehabilitation
- 50.959 Rehabilitation Research
- 50.962 Administration of a Sheltered Workshop
- 50.964 Rehabilitation and the Law
- 50.965 Occupational Placement
- 53.815 Rehabilitation Counseling Strategies

Interrelated Programs in Special Education

Northeastern University offers an interrelated program in Special Education with options leading to preparation for work with children having mild to moderate handicaps (learning disabilities, mental retardation, emotional disturbance) or those having severe handicaps in one or more of the above areas. A further option at the master's level for persons planning to work outside the classroom with schools and/or public agencies in an advocacy role is that of the Special Education Community Personnel (SECP).

Eligibility for certification at the elementary or secondary level is prerequisite to beginning the special education sequence and may be earned through satisfactory completion of prescribed work in elementary or secondary education at Northeastern. Applicants certified at the secondary level may need additional work in remedial teaching at the elementary level to prepare for work with handicapped youngsters.

Degree candidates may be required to take 50.803 (Child Psychology), 50.807 (Abnormal Psychology), and an introductory course in statistics without degree credit if such work has not been taken previously, or in the latter case, is not satisfied through the programmed learning course.

Completion of the SECP program or an option leading to certification in a single area will normally require four quarters. Certification in two areas (e.g., learning disabilities and mental retardation) may require an extra quarter of work.

All teacher preparation programs assume possession or acquisition of a solid core of knowledge and experience with the normal child and his curriculum and the special child and his adapted curriculum. Emphasis is on the learning problem approach. Educational settings utilized for field work include public and private schools, day and residential facilities, and hospital-based educational facilities. A sequenced program will be developed in consultation with the major adviser based upon the student's background and experience. It will include basic

requirements of the graduate school, the Division, and the State Department of Teacher Certification (where appropriate). Electives will be drawn from other programs as warranted.

Completion of all programs in special education is contingent upon the candidate's demonstration of competency in specified fields of knowledge and skills. An oral comprehensive examination will be taken near the end of the student's third quarter of work.

Financial Aid — Traineeships

A limited number of traineeships through Federal grants is anticipated for 1974-1975. The student in need of financial help should discuss the matter during the interview with the Division faculty member. The Department has also attempted to develop paid internships in a variety of settings in order to offer students other opportunities for professional development as well as a means of financial assistance. Students selected for an internship will need to plan for a program extending over approximately two years. (Refer also to Financial Aid, page 29).

Core Curriculum Requirements

In addition to the Foundations of Education core requirements described on pages 42 and 43, the programs in the Division of Special Education have the following common core of required courses:

- | | |
|-------------------------------|---|
| 55.880, 55.881 | Developmental Aspects of Physical, Mental, and
Emotional Dysfunction |
| 55.840 | Psychology of Mental Retardation and Other
Handicapping Conditions |
| (numbers vary
with option) | Field work and Seminar
Student Teaching or Practicum |

The last two courses are specific to the student's major interest. The core requirements constitute five of the minimum twelve courses of the master's degree. Additional courses, specified by the Massachusetts Department of Teacher Certification, are included below in each area of specialization. The program for each student is designed in relation to his educational and experiential background, his professional goals, and the limitations (such as certification) implied by such goals.

Teacher Preparation Options

Mental Retardation — Learning Disabilities

This area of specialization prepares students to work with mildly handicapped pupils in a self-contained class or as a resource teacher in a school where classes have been integrated. The sequence is designed to meet present state requirements for certification in the areas of Mental Retardation and Learning Disabilities.

Recommended Core Courses

- 50.808 Seminar in Child Development
 50.805 Personality and Social Structure

Department and/or State Requirements

- 55.807 Learning Disabilities
 55.840 Psychology of Mental Retardation and Other Handicapping Conditions
 55.880, 881 Developmental Aspects of Physical, Mental, and Emotional Dysfunction
 55.841 Methods and Materials
 55.842 Methods and Materials
 55.844 Measurement and Evaluation
 55.855 Fieldwork and Seminar
 55.856 Student Teaching — Mentally Retarded

Electives chosen from:

- 55.843 Industrial Arts & Crafts — Vocational Education
 55.848 Identification of Preschool Learning Problems
 53.810 Elementary School Guidance
 55.845 Rehabilitation for Special Education Teachers
 55.847 Seminar in Mental Retardation
 55.833 Mental Health
 55.835 Socio- and Psychodynamics of Family Life
 55.839 Multiply Handicapped

Others in consultation with adviser

Emotional Disturbance — Learning Disabilities

This area of specialization prepares students to work with mildly handicapped pupils in a self-contained class or to work as a resource teacher where classes have been integrated. Courses are designed to meet present state requirements in the areas of Emotional Disturbance and Learning Disabilities:

Recommended Core Courses

- 50.808 Seminar in Child Development
 50.805 Personality and Social Structure

Department and/or State Requirements

- 55.807 Learning Disabilities
 55.880, 881 Developmental Aspects of Physical, Mental, and Emotional Dysfunction
 55.831 Teaching the Emotionally Disturbed
 55.840 Psychology of Mental Retardation and Other Handicapping Conditions
 55.842 Methods and Materials
 55.845 Rehabilitation for Special Education Teachers

55.850 Field Work and Seminar

55.851 Student Teaching of the Emotionally Disturbed

Electives chosen from

55.833 Mental Health

55.837 Seminar: Problems of the Emotionally Disturbed

55.844 Measurement and Evaluation

55.839 The Multiply Handicapped

55.841 Methods and Materials

55.835 Socio- and Psychodynamics of Family Life

55.848 Identification of Preschool Learning Problems

55.849 Special Education for the Gifted

Others in consultation with adviser.

Teaching the Severely Handicapped

Modifications of either of the two programs described above may be made for the student who desires to teach severely handicapped children or adults in an institution or community-based facility.

*Special Education Community Personnel
(A Noncertification Program)*

Northeastern University, Department of Rehabilitation and Special Education, in response to identified needs and national trends, offers a program for individuals with broad interests and abilities to prepare them to function as advocates for handicapped children and youth and to act as liaison between community agencies and the school.

Implied in such a program is the possession or acquisition of knowledge of social problems, teaching, community and school organization, child development, problems of multiple handicaps, and facilities for care, treatment, and remediation. Implied also are skills in working with the handicapped, with peers in numerous professions, and with techniques of survey research. Integrated course and field work experiences will be designed to complement each applicant's background of education and experience. Approximately four to five quarters are estimated for demonstration of competence in the specified areas.

Recommended Core Courses

50.810 Psychology of Personality

50.820 Seminar in Contemporary Issues in American Education

Department Requirements

55.880, Developmental Aspects of Physical, Mental, and

55.881 Emotional Dysfunction

55.840 Psychology of Mental Retardation and other
Handicapping Conditions

55.807 Learning Disabilities

55.853 Field work and Seminar

55.854 Practicum

Electives chosen from

- 50.952 Rehabilitation and Social Service
- 50.956 Community Planning in Rehabilitation
- 55.835 Socio-Psychodynamics of Family Life
- 55.839 Multiply Handicapped
- 55.845 Rehabilitation for Special Education Teachers
- 51.920 Methods and Materials in Adult Literacy Education

Other courses in consultation with adviser.

Speech Pathology and Audiology

The program leading to the degree of Master of Education in either Speech Pathology or Audiology is designed to qualify candidates for membership in and certification by the American Speech and Hearing Association. Graduates of the program are also qualified for further graduate study and for employment as speech pathologists or audiologists in clinics, hospitals, public schools, and rehabilitation centers.

This program assumes that students have completed an undergraduate preprofessional program in speech and hearing. Those without such preparation will be required to complete additional courses beyond the 48 quarter hours normally required for the master's degree.

This program is conducted with the cooperation of a large number of community agencies.

Speech Pathology

Each student's program is individually designed with the assistance of a faculty adviser to assure that course work is distributed in all major professional areas including: diagnostics, articulation, language, fluency, voice, and audiology. The student is also advised about how his program prepares him to meet certification requirements established by the American Speech and Hearing Association.

Master of Education Core (required of all candidates)

Three courses as defined on pages 42 and 43.

Speech Pathology Courses

A minimum of nine courses selected from the following or appropriate electives:

- 55.803 Cerebral Palsy
- *55.804 Aphasia
- 55.805 Disorders of Voice
- *55.806 Language Disturbances in Children
- 55.811 Clinical Management in Stuttering
- *55.812 Differential Diagnosis in Speech and Language Pathology
- *55.813 Advanced Clinical Practice
- *55.816 Test Procedures in Speech and Language Pathology
- 55.817 Advanced Anatomy, Neurology and Physiology of Speech-Hearing Mechanism

*Required or an equivalent graduate level course.

- 55.822 Seminar in Oro-facial Anomalies
- 55.823 Psycho-social Aspects of Communication Disorders
- 55.861 Neuropathology
- 55.824 Seminar in Speech Pathology
- 55.860 Aphasia Rehabilitation
- 55.861 Neuropathology
- 55.863 Advanced Study of Articulation Disorders
- 55.891 Thesis (optional)
- 55.899 Directed Study (optional)

Satisfactory completion of a comprehensive examination is a requirement of this program.

Audiology

Each student's program is individually designed with the assistance of a faculty adviser to assure that course work is distributed among evaluation, diagnosis, and aural rehabilitation. The student is also advised about how his program prepares him to meet certification requirements established by the American Speech and Hearing Association.

Master of Education Core (required of all candidates)

Three courses defined on pages 42 and 43.

Audiology Courses

A minimum of nine courses selected from the following or appropriate electives:

- *55.813 Advanced Clinical Practice
- 55.814 Clinical Audiometry I
- 55.815 Clinical Audiology
- *55.817 Advanced Anatomy, Neurology, and Physiology of Speech-Hearing Mechanism
- *55.818 Pathologies of the Ear
- 55.819 Clinical Audiometry II
- 55.820 Physiological Acoustics
- 55.821 Seminar in Audiology
- 55.823 Psycho-social Aspects of Communication Disorders
- 55.862 Psycho-acoustics
- 55.825 Teaching Speech to Deaf Children
- 55.826 Teaching Language and Reading to Deaf Children
- 55.828 Aural Rehabilitation
- 55.891 Thesis (optional)
- 55.899 Directed Study (optional)

Satisfactory completion of a comprehensive examination is a requirement of this program.

*Required or an equivalent graduate level course.

*Teaching the Deaf
(Program not offered 1974-75)*

The following curriculum in the preparation of teachers of the deaf is offered in affiliation with the Beverly School for the Deaf. Candidates lacking prerequisite courses will be required to complete them prior to the following program.

Master of Education Core (required of all candidates)

Three courses as defined on pages 42 and 43.

Teaching the Deaf Requirements

- 55.801 Special Education for the Regular Classroom Teacher
- 55.814 Clinical Audiometry I
- 55.815 Clinical Audiology
- 55.816 Test Procedures in Speech and Language Pathology
- 55.825 Teaching Speech to the Deaf
- 55.826 Teaching Language and Reading to the Deaf
- 55.827 Methods and Materials in Deaf Education
- 55.828 Aural Rehabilitation
- 55.852 Practicum: Teaching the Deaf (8 quarter hours)

**NONDEGREE PROGRAM FOR CERTIFICATION
OF ELEMENTARY AND SECONDARY TEACHERS**

This program is designed to qualify college graduates for certification as elementary or secondary teachers in the Commonwealth. Students who are interested in qualifying to teach in other states should obtain a copy of that state's certification requirements and bring it to the initial interview with their advisers.

This program does not lead to any higher degree. However, individuals who are able to be full-time graduate students may apply for simultaneous admission to the Master of Education program in Curriculum and Instruction.

This program is open to college graduates who meet the general admissions requirements of the Master of Education degree and who have completed a course in either child or adolescent psychology. (These courses are offered by the Graduate School of Education and may be taken while the student is enrolled in the program.) In addition, candidates for secondary certification must have completed, before admission, at least 36 quarter hours of courses in the field in which they are preparing to teach with a QPA for all courses taken in that field of at least 2.000.

The program consists of (a) three successive courses which meet in the late afternoon or evening two days a week for two hours each day, and (b) student teaching which requires the student to student teach full time during the spring quarter and to attend a two-hour seminar every other week.

The program may be most conveniently completed in four consecutive quarters, beginning in the Summer Quarter. However, students may enter the program in the Fall Quarter and by taking two courses in that quarter and one in the Winter Quarter be prepared for student teaching.

It is expected that students enrolled in this program will complete their student teaching during the Spring Quarter. Because of the unique demands of student teaching, participants should plan to devote full time to that aspect of the program.

Students may apply for credit in a recognized graduate school degree program a maximum of two Teacher Certification courses, not to exceed twelve quarter hours, with permission of their advisers.

Course Sequence

(The courses must be taken in the order listed):

- 51.801 Curricula of American Schools
(Offered in the Summer and Fall Quarters only)
- 51.800 Principles of Teaching
(Offered in the Fall Quarter only)
- 51.806 Methods and Materials in the Education of Adolescents and Adults
(Offered in the Winter Quarter only)
or
- 51.807 Methods and Materials in the Education of Children
(Offered in the Winter Quarter only)
- 51.805 Student Teaching with Related Seminar
(Offered in the Spring Quarter only)

Applications for Student Teaching must be received by the Director of Field Placement no later than October 15.

CERTIFICATE OF ADVANCED GRADUATE STUDY

The Certificate of Advanced Graduate Study is available to applicants who have demonstrated a strong background in the special field of study at the master's level and who meet the specific requirements of the Graduate School of Education and the appropriate department. CAGS programs are offered in the areas of:

- Counselor Education
- Pupil Personnel Services Administration
- Community Mental Health
- Rehabilitation Counseling
- Educational Administration
- Cooperative Education
- Educational Administration
- Higher Education
- Instructional Technology
- Rehabilitation and Special Education

All students must complete one of the programs as outlined in the following pages. In most cases, the sequence is designed to be very flexible. Any variations or changes must have the prior recommendation of the major adviser and approval of the Director of the Graduate School of Education.

Counselor Education

The CAGS represents a second year of preparation beyond the master's degree for the counseling and human services field. This is not a pre-doctoral program but a terminal professional degree program. There are three major options in the Counselor Education Department: Pupil Personnel Services Administration, Community Mental Health, and Rehabilitation Counseling. Students with master's degree work in rehabilitation counseling who wish to emphasize administrative preparation at the CAGS level should enter the Rehabilitation Administration program. Students with master's degrees in College Counseling and Student Personnel who wish to pursue careers in higher education with an administrative emphasis should enter the Higher Education Administration program.

Each of these counselor education program options presumes master's level preparation in counseling the equivalent of that offered at Northeastern. Students whose master's program in Counselor Education lacked a practicum will be required to take 53.805-53.806 in addition to the minimum course requirements for the CAGS. Students with master's degrees in fields other than counseling will, if otherwise admissible, be required to make up a minimum of five courses from the master's program. These students will need a minimum of two years to complete the requirements for the CAGS.

In addition to the course requirements, students must pass a comprehensive examination (written and/or oral) before the certificate will be awarded.

Applicants for the CAGS will be accepted during the period of April 1 to November 1, with a deadline of September 15 for completing all application procedures. After filing all application materials required by the Graduate School, applicants will be contacted by the Department to arrange for admissions interviews during the admitting period. Since there are a limited number of spaces in the CAGS program, early application is urged.

Pupil Personnel Services Administration

Students who have prepared themselves for school counseling positions and who are interested in leadership positions in guidance and pupil personnel services should choose this option. The program provides for further work in counseling, but emphasizes administrative

and organizational preparation for the effective delivery of personnel services to students. Field placements will provide for the development of skills and knowledge in planning, supervision, and delivery of services within the context of the total educational program of the school system.

Courses

- 53.840-53.841 Advanced Field Work
- 53.834 Advanced Theories of Behavior Change
- 53.807 Administration of Guidance Services
- 53.833 Seminar in Counseling Supervision and In-Service Education
- 53.836 Systems Approach to the Development of Human Services
- 52.810 Leadership I
- 52.811 Leadership II
- 52.831 Innovation and Change in American Public Schools
- 52.832 The Process of Administration

Two Electives

Community Mental Health

Students whose primary interest is the delivery of individual and group counseling services in a variety of settings, including but not limited to, schools, college counseling centers, and mental health centers, should choose this option. This program provides for a more "therapeutic" orientation but is not as focused on a particular setting or category of settings. Field placements will provide for the development of the student's individual and group counseling skills and will be varied according to individual need and interest. Mental health settings will tend to predominate in the field assignments.

Courses

- 53.840-53.841 Advanced Field Work
- 53.834 Advanced Theories of Behavior Change
- 53.816 Psychological Counseling Strategies
- 53.818 Case Studies in Marriage and Family Counseling
- 53.831 Advanced Group Counseling
- 53.835 Psychodiagnostic Measures
- 50.819 Theories of Developmental Psychology
- 55.835 Socio- and Psychodynamics of Family Life
- 50.807 Abnormal Psychology

Two Electives

Rehabilitation Counseling

This is an advanced level program for students who desire to work with the various populations described under the master's degree program related to this area. The special emphasis of the program will be

in the acquisition of 1) advanced counseling skills, 2) supervisory skills, 3) program development skills, and 4) administrative skills. The student trained at this level will retain his identity and function as a counselor, but he will also be prepared for supervisory and staff training functions. In addition, he will acquire skill in the planning and development of new and modified service programs, including the capability of preparing necessary designs for grant applications, program evaluation, and other related tasks. The administrative training will prepare the student for possible assumption of leadership positions in the delivery of human services.

Courses

- 53.840-53.841 Advanced Field Work
- 53.834 Advanced Theories of Behavior Change
- 53.831 Advanced Group Counseling
- 53.836 Systems Approach to the Development of Human Services
- 53.818 Case Studies in Marriage and Family Counseling
- 50.980 Psychological Problems of Disability
- 50.982 Essentials of Case Management and Supervision
- 50.983 Rehabilitation of Alcoholic and Drug Dependent
- 50.984 Rehabilitation of the Penal Offender

Two Electives

Educational Administration

Beyond the master's degree level, four advanced administrative training programs at the Certificate of Advanced Graduate Study (CAGS) level are offered. These programs are in the fields of Cooperative Education, Educational Administration, Higher Education, and Instructional Technology.

Cooperative Education

A program of study at the master's level in the area of Cooperative Education is located in the Counselor Education Department. The program offered here is an advanced one aimed at the preparation of administrators of cooperative education programs in a variety of settings: the public schools, vocational-technical schools, and junior colleges, as well as at other institutions of higher learning.

A typical program is as follows:

Required Core

- 52.830 Current Issues in Educational Administration
- 52.831 Innovation and Change in American Public Schools
- 52.832 The Process of Administration
- 51.900 Cooperative Education in America
- 52.824 The Administration of Cooperative Education

Electives

A minimum of seven to be selected in consultation with the student's adviser. These courses will be drawn from the appropriate areas of administration, counselor education, or other related offerings depending upon the student's career goals in settings such as: colleges, junior colleges, public schools, and other educational agencies.

Upon completion of this program, a comprehensive examination is given to each student.

Educational Administration

The Certificate of Advanced Graduate Study (CAGS) program in Educational Administration is designed to provide the student with a closer examination of a particular administrative or supervisory position. Extending beyond the generic master's degree program, major emphasis is given to role specialization and the particular skills that should be acquired by prospective and practicing school administrators. Completion of this program should develop further the leadership capabilities essential to the student's area of specialization such as: the principalship of a large school; the assistant superintendency; the superintendency of a small district or supervisory union; directorship of federal system-wide, or state education department programs.

A minimum of 12 courses beyond the master's degree is required for completion of the program as well as satisfactory completion of a comprehensive examination.

Core Courses (required)

- 52.830 Current Issues in Educational Administration
- 52.831 Innovation and Change in American Public Schools
- 52.832 The Process of Administration

Electives

- 52.834 Educational Finance
- 52.835 School Business Management
- 52.836 Personnel Administration
- 52.837 School-Community Relations
- 52.838 School Plant Planning, Operation, and Maintenance
- 52.840 Problems in School Administration: A Simulated Experience — The Superintendency
- 52.842 Problems in School Administration: A Simulated Experience — Assistant Superintendent for Instructional Services
- 52.899 Directed Study
- 52.843 Administrative Internship

(cont.)

- 52.844 School Law
- 52.865 Systems Theory in Education
- 52.866 Politics and Educational Decision-Making

Higher Education

This program of study is directed toward the training of college administrators. Emphasis is placed on the development of attitudes, understandings, and skills necessary to prepare the potential administrator and to give this development the necessary philosophic base on which the administrator can build an effective career.

A typical program is as follows:

Required Core

- 52.830 Current Issues in Educational Administration
- 52.831 Innovation and Change in American Public Schools
- 52.832 The Process of Administration

Electives

A minimum of nine to be selected in consultation with the student's adviser. These courses will be drawn from appropriate areas of administration, counselor education, and other related offerings depending upon the particular higher education specialization of the student.

Upon completion of this program, a comprehensive examination is given to each student.

Instructional Technology

The Certificate of Advanced Graduate Study (CAGS) program in Instructional Technology is designed to provide the student with advanced administrative and instructional technology skills. Four areas of contact are integrated into this advanced program. A broad exposure is presented in the field of educational administration through the core courses. Instructional technology electives provide the student with advanced techniques of using modern technology for instructional purposes. By means of educational administration electives, reasonable depth is provided in such areas as finance, physical facilities, and community relations. And finally, by means of additional electives throughout the university, further contacts and expertise may be attained.

Upon completion of this advanced program, the student is prepared to assume top leadership in the field of instructional technology in central office positions of a public school system as well as directorship of such specialized programs in industry, government, institutions of higher learning, and privately operated instructional programs in urban settings.

A typical program is as follows:

Educational Administration Core Courses (3)

- 52.830 Current Issues in Educational Administration
- 52.831 Innovation and Change in American Public Schools
- 52.832 The Process of Administration

Instructional Technology Electives (minimum of 4 as approved by the adviser)

Educational Administration Electives (minimum of 4 as approved by the adviser)

Electives (optional number)

Upon completion of the above program, a comprehensive examination is given to each student.

Rehabilitation and Special Education

Rehabilitation Administration

The CAGS Program in Rehabilitation Administration is offered for students who already possess a master's degree in rehabilitation administration or its equivalent. It is intended to enable a student to develop advanced skills in the areas of program planning, decision making, communication and research design in administration. In addition, the educational experience will be substantively focused in areas of service to fields of corrections, alcohol and drug addition, geriatrics, and social welfare.

A minimum of twelve (12) courses beyond the master's degree is required for completion of the program as well as satisfactory completion of a qualifying and a comprehensive examination.

Departmental Core Courses (Required)

- 50.959 Rehabilitation Research
- 50.980 Psychological Problems of Disability
- 50.981 Administrative Problems in Rehabilitation
- 50.986 Critical Issues in Rehabilitation Administration

Electives

- 50.982 Essentials of Case Management and Supervision
- 50.983 Rehabilitation of Alcoholic and Drug Dependent
- 50.984 Rehabilitation of the Penal Offender
- 50.985 Rehabilitation of the Geriatric Client
- 52.832 The Process of Administration
- 52.836 Personnel Administration
- 52.843 Administrative Internship
- 52.899 Directed Study
- 53.836 Systems Approach to the Development of Human Services
- 55.832 Group Dynamics
- 55.833 Mental Health

Special Education Administration

An interrelated program at the CAGS level is designed to prepare administrators of Special Education programs in public schools and in local and state institutions and agencies.

Students entering the CAGS program in Special Education Administration must have a master's degree, equivalent to that offered at Northeastern, in one or more areas of special education and at least three years of classroom experience. Some students may have to take prerequisite courses to satisfy deficiencies.

Core Requirements

- 52.830 Current Issues in Educational Administration
- 52.831 Innovation and Change in American Public Schools
- 52.832 The Process of Administration
- 50.953 Organization and Administrative Theory

Department Requirements

- 50.952 Rehabilitation and Social Services
- 55.870 Seminar in Special Education Administration
- 55.839 Multiply Handicapped
- 52.843 Administrative Internship

Electives chosen are dependent upon student's past educational and experiential background.

In addition to course requirements and demonstration of competencies in both academic and practicum areas, students must pass a written and/or oral comprehensive examination before the certificate will be awarded.

description of courses

All courses carry four quarter hours of credit unless indicated otherwise. Please see the current schedule for summer, fall, winter, and spring quarter listings.

FOUNDATIONS OF EDUCATION

50.801 Educational Anthropology

Examination of schooling as a particular variety of socialization, with special attention to characteristics of societies that rely heavily on formal instruction, contrasted with less deliberately patterned techniques of child-rearing. Readings will be mainly cross-cultural, ethnographic, and historical. The emphasis of the course varies from quarter to quarter, and will be announced in the registration materials distributed in advance of each quarter. (core course)

50.802 Sociology of Education

The functioning of educational institutions in their social and cultural milieu will be examined from anthropological and sociological perspectives. The school as a social system; influence of the stratification system, youth cultures, and racial antagonisms upon the educational enterprise. (core course)

50.803 Child Psychology

A review of the principles of child development from birth to pre-adolescence. Particular emphasis will be placed on intellectual, social, and emotional development. The theoretical formulations of psychoanalysis, social learning theory, and Piaget will be discussed in the context of relevant research in these areas, as well as their educational implications. (core course)

50.804 Adolescent Psychology

Social, emotional, and intellectual development through the adolescent years. Problems in family relationships and in the adolescent's social environment as well as his adjustment in school. Case history material. (core course)

50.805 Personality and Social Structure

Human behavior from a combined psychodynamic and sociological point of view, with special emphasis on socialization and the relations between the individual and the collectivity. The integration of relevant theories from psychology, sociology, and anthropology. *Suggested Prep. a course in sociology, cultural anthropology, or social psychology.* (core course)

50.806 Psychology of Learning

The basic principles and conditions of acquisition, retention, and transfer of learning. *Suggested Prep. a course in psychology.* (core course)

50.807 Abnormal Psychology

How personality becomes disordered. Problems of neurosis, character disorders, psychosomatic disorders, and psychoses. Current methods of clinical diagnosis and treatment will be reviewed. (With the approval of the adviser, may serve as a core course for students majoring in Counselor Education, Rehabilitation Administration, Special Education, Speech Pathology and Audiology.)

50.808 Seminar in Child Development

A seminar course with emphasis on discussion of child development theories with special reference to personality and cognitive development. Critical evaluation of research related to child development theories with particular emphasis on recent trends, new approaches, and relevance to educational theories and practices. *Prep. a course in child psychology or human development.* (core course)

50.809 Seminar in Adolescent Development

A seminar course with emphasis on discussion of major problem areas facing the adolescent in our society today. Particular emphasis will be given to social and emotional development. Included will be a survey of research in such areas as psychoanalysis, social learning, morality, and delinquency. *Prep. a course in adolescent psychology or human development.* (core course)

50.810. Psychology of Personality

An examination of theoretical approaches to the study of personality, with emphasis upon theories dealing with dynamic factors in personality development. The role of social and cultural factors, as well as implications of various theories for the therapeutic processes, will be considered. *Suggested Prep. a course in psychology.* (core course)

50.811 Psychology of Cognition

A consideration of the processes involved in cognitive organization and functioning. Topics will include: language, concept formation, and problem solving. *Suggested Prep. a course in psychology.* (core course)

50.812 History of Education

An opportunity to explore some of the historical roots of contemporary educational theory and practice, with a focus on selected aspects of educational history from antiquity to the present. Also, an opportunity to utilize any knowledge gained for the development of a personal educational position. (core course)

50.813 Philosophy of Education

An introduction to the basic precepts of philosophy as viable tools with which to build a philosophy of education. An analysis of major philosophic world-frames in their historical context; i.e. Aristotelian, Thomistic, idealistic, realistic, and pragmatic. An examination of philosophies of education which cover the broad spectrum of thought, ranging from authoritarian to democratic, determining from this examination where along the continuum to place the foundation from which to build one's own personal philosophy of education to be translated into conduct in the classroom. (core course)

50.814 The Nature and Theory of Psychological and Educational Measurement

An examination of the logic of measurement and the nature of human capacities, aptitudes, and abilities. Characteristics of tests, ratings, questionnaires, and similar instruments are reviewed with emphasis on their reliability, validity, and useability. Item analysis procedures and test standardization are covered.

50.815 Research Design in Education

An introduction to scientific methods of research in education and related fields. Stress will be placed on a critical reading and understanding of research literature, formulating research hypotheses, constructing a research proposal, and carrying out an individual or group project. This course must be included among the first six courses taken by each student. (core course)

A course in statistics, or competence in this field, as demonstrated by successful completion of a statistics proficiency exam, is required prior to taking this offering. A no-credit, no-charge programmed course in statistics has been arranged for this purpose and is available through the University's Learning Center, 406 Dodge. The regular tuition course, 50.841, is also available. Students choosing the proficiency exam route may also use the services of a special teaching assistant who has been appointed to advise and assist them. The office hours and location of the teaching assistant will vary from quarter to quarter and may be obtained from the Foundations Department Secretary in 306 Cushing.

50.817 Research Problems in Education

Each student will identify a research problem, review the relevant research literature, design an appropriate methodology, and prepare a written research proposal. *Prep. 50.815, Research Design in Education or 50.840, Introduction to Educational Research.*

50.818 Comparative Education

Introduction to education in other nations to explore relationships with the political, economic, social, and cultural milieu: Western and Eastern Europe, South America, and Africa will be considered. (core course)

50.819 Theories of Developmental Psychology

The major developmental theories and related research of Havighurst, Erickson, Piaget, and others. *Prep. permission of instructor.*

50.820 Seminar in Contemporary Issues in American Education

Discussion of selected issues in contemporary American education such as school desegregation, compensatory education, learning problems of the disadvantaged, professionalization of teachers, etc. Review of relevant research and opinions. The topic or topics of the seminar for a particular quarter will be announced in the registration materials distributed in advance of that quarter. (core course)

50.840 Introduction to Educational Research

An introduction to the rationale and procedures for educational research: the use of theory in the formulation of research problems and hypotheses; review

and summarization of research literature; isolation and definition of variables; and design of educational studies and experiments. *Open only to Educational Research majors.*

50.841 Introduction to Educational Statistics

Basic descriptive statistics for measurement and research. Topics include use of statistical notation, measures of central tendency and variability, probability and sampling techniques, theoretical distributions, linear regression and correlation, and an introduction to statistical inference.

50.842 Intermediate Educational Statistics

Statistical inference of normal populations and discrete data; estimation; testing of hypotheses; multiple correlation; analysis of variance and covariance; contingency; the chi-square test and other non-parametric tests. Emphasis is given to application in educational research.

50.843 Research Methods I

Each student will begin a research study designed in a prior research course. *Prep. 50.817, Research Problems in Education or 50.845, Research Internship and Field Seminar I. (May not be offered 1974-1975.)*

50.844 Research Methods II

Each student will complete the research study designed in 50.817 Research Problems in Education. *Prep. 50.843, Research Methods I. (May not be offered 1974-1975.)*

50.845 Research Internship and Field Seminar I

(6 Quarter Hours)

Open only to Educational Research majors. (May not be offered 1974-1975.)

50.846 Research Internship and Field Seminar II

(6 Quarter Hours)

Open only to Educational Research majors. (May not be offered 1974-1975.)

50.847 Introduction to Computer Programming: FORTRAN IV

A laboratory course designed to develop facility in the use of a wide range of data processing equipment in educational research. Students will be introduced to the basic principles of computer programming, but emphasis will be placed on the applicability and use of existing statistical programs.

50.850 Communications Theory

An introduction to communications theory, covering models of the communication process, attitude changes, information, innovation, dissemination and flow, communication modalities and language processing. (core course)

50.891 Thesis

A research activity that may be elected by the student in lieu of two courses (8 quarter hours), with the approval and recommendation of the adviser.

50.895 Institute in Foundations of Education

(see general institute description on page 108)

50.898 Workshop in Foundations of Education

(see general workshop description on page 108)

50.899 Directed Study

This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the Department. *Prep. approval of the Chairman of the Department and of the Director of the Graduate School of Education. (Approval forms must be submitted during the quarter prior to registration for the Directed Study.)*

CURRICULUM AND INSTRUCTION

51.800 Principles of Teaching

(6 quarter hours)

A consideration of the rational bases for effective teaching. Efforts are made to relate learning theory and educational objectives to various strategies and tactics of teaching. The functions of the teacher are examined as components of learner development. *Prep. a course in child or adolescent psychology and 51.801 Curricula of American Schools. Fall Quarter only. Open only to students in the Nondegree Certification Program.*

51.801 Curricula of American Schools

(6 quarter hours)

Methods of organizing material to be learned at the state, district, school, and classroom level to meet the needs and to match the abilities of the students. Attention will be given to innovative practices which are found both within and outside of the public school system. *Summer and Fall Quarters only. Open only to students in the Nondegree Certification Program.*

51.805 Student Teaching with Related Seminar

(8 quarter hours)

A University-arranged practicum of observation and teaching in schools offering comprehensive programs within reasonable commuting distance of Northeastern. Participating on a full-time basis, the student is expected to develop planning and communication abilities within his major field. Biweekly seminars at the University provide additional opportunity to analyze theory-practice relationships and to examine generic problems of teaching. *Prep. course in child or adolescent psychology; 51.800, Principles of Teaching; 51.801, Curricula of American Schools; 51.806, Methods and Materials for Teaching Adolescents and Adults or 51.807, Methods and Materials for Teaching Children. Generally completed during the Spring Quarter. Open only to students in the Nondegree Certification Program.*

**51.806 Methods and Materials for Teaching Adolescents
and Adults**

(6 quarter hours)

Teaching methods and learning materials used in teaching adolescents and adults in a number of educational settings and for a number of purposes. The course will help students identify objectives, plan and execute appropriate learning experiences, and evaluate outcomes. From time to time, special sections will be organized for students within a particular subject field. *Prep. 51.800 Principles of Teaching. Winter Quarter only. Open only to students in the Non-degree Certification Program.*

51.807 Methods and Materials for Teaching Children (6 quarter hours)
Teaching methods and learning materials used in teaching children in a number of educational settings. This course will help students establish objectives, plan and execute appropriate learning experiences, and evaluate outcomes. *Prep. 51.800 Principles of Teaching. Winter Quarter only. Open only to students in the Nondegree Certification Program.*

51.810 Modern Topics in Elementary School Mathematics

An introduction to the modern elementary school mathematics curriculum for teachers and students preparing to teach who are not acquainted with these topics.

51.811 Mathematics of the Primary Grades

The concepts of arithmetic and geometry found in modern mathematics courses for grades K-3. *Prep. teaching experience.*

51.812 Mathematics of the Middle Grades

The concepts of arithmetic and algebra found in modern mathematics courses for grades 4-6. *Prep. teaching experience.*

51.813 Informal Geometry for Teachers

The concepts of geometry found in the modern mathematics curriculum of grades 4-8. *Prep. teaching experience.*

51.824 The Teaching of Geometry in the High School

A study of students, teaching methods, and courses in geometry with re-examination of selected background topics, including two-value logic, methods of proof, postulational systems, and analytical methods.

51.825 Seminar in Mathematics Education

Each student is expected to analyze a mathematics learning problem, to investigate relevant research, and to prepare materials embodying his own proposed solution. *Prep. permission of instructor.*

51.828 The Teaching of Elementary Calculus

An examination from an advanced viewpoint of selected topics in elementary calculus, including limits applied to formal differentiation, continuity, uniform continuity and intermediate values, boundedness and existence of extremes, differentiable functions, areas and integration, and properties of the Riemann integral. *Prep. teaching experience.*

51.830 Concepts of Earth Science for Elementary Teachers

Selected topics in the earth sciences considered from a philosophical and/or historical point of view to illustrate and emphasize man's interrelationship with his ecological environment; with laboratory work. (51.830, 51.831, and 51.832 are not sequential, and may be taken in any order.)

51.831 Concepts of Biology for Elementary Teachers

Selected topics in the biological sciences considered from a philosophical and/or historical point of view; a realistic consideration of man's place in his

biological world; with laboratory work. (51.830, 51.831, and 51.832 are not sequential, and may be taken in any order.)

51.832 Concepts of Physical Sciences for Elementary Teachers

Selected topics in the physical sciences considered from a philosophical and/or historical point of view; the appraising of claims and counter-claims relative to the pollution of man's physical environment; with laboratory work. (51.830, 51.831, and 51.832 are not sequential, and may be taken in any order.)

51.837 Curriculum Problems in Science and Mathematics Education

The process of identifying problems and evaluating proposed solutions, taking into consideration the needs of the student population, the dichotomy of theory and applications in course design, and the role of common processes and conceptual schemes in integrating seemingly disparate courses. Traditional and modern programs will be investigated in terms of the problems they were designed to solve, their success or failure in this mission, and the relevance of such programs to present problems. *Prep. teaching experience or certification.*

51.838 Seminar in Science and Mathematics Teaching

The analysis and evaluation of a number of types of teaching strategies and learning materials, including laboratory materials and techniques, printed matter of all types, games, kits, multimedia materials, and interactive computer programs. Each student will be expected to undertake an extensive project applying his knowledge of strategies and materials to the achieving of previously identified objectives and appropriate to a given class, group, or individual student. *Prep. teaching experience or certification.*

51.839 Implementing Change in Science and Mathematics Education

The planning, organization, and execution of inservice experiences for teachers related to all phases of science and mathematics education from subject-matter courses to curriculum planning to materials workshops. *Prep. teaching experience or certification.*

Recommended: 51.837 Curriculum Problems in Science and Mathematics Education, 51.838 Seminar in Science and Mathematics Teaching, and 51.881 The Dynamics of Curriculum Development.

51.842 The English-Language Arts Curriculum

The design and function of the English-language arts curriculum; selected current issues as they impinge upon the English-language arts curriculum; the design and function of research in the English-language arts curriculum. Open to certified or experienced teachers; required of all candidates for the Master of Education in Curriculum and Instruction: English, and the Master of Education in Curriculum and Instruction: Language Arts. *Prep. permission of instructor.*

51.846 English As a Second Language I

First course in teaching ESL introducing the basic linguistic, cultural, and psychological concepts. Analysis of current approaches to teaching ESL locally and internationally from the standpoint of diagnosis, grouping, use of particular methods, and materials. Observations of ongoing ESL programs locally will be included. *Prep. 51.871 Reading and Language Disabilities I or permission of instructor.*

51.847 English As a Second Language II

Second course in the ESL sequence which emphasizes innovative means in teaching ESL. Specific projects according to student need and interest will be developed, and supervised clinical work. *Prep. 51.846 English as a Second Language I.*

51.849 Topics in English-Language Arts Education

An investigation of a matter of immediate concern to English-language arts education but for which no organized study is ordinarily available. Typical topics are: media in the English-language arts program; behavioral objectives in the English-language arts program; the English-language arts program for the disadvantaged. Each year the seminar topic for that year is announced prior to registration.

51.851 Seminar in Current Issues in the Social Studies

A content approach to problems of political, economic, and social significance which have contemporary relevance for teachers of the social sciences.

51.853 History and the Social Studies in the School Curriculum

Permits the student to explore some of the fundamental concepts of anthropology, sociology, economics, political science, and history. Emphasis will be given to the interrelatedness of disciplines and to the extraction of operating principles from those that aid in the analyses of social problems. As a consequence of such analysis, the student should be equipped to find a greater variety of conceptual relationships within the historical social science field. From there a framework for evolving courses of study can be generated. *Prep. teaching experience or certification.*

51.854 Social Science Materials Seminar

A curriculum course wherein the knowledge previously acquired will be used to establish criteria for the selection and development of curriculum materials. All materials of instruction will be viewed as means of implementation of objectives relating to specific social science concepts and skills. An effort will be made to personalize and concretize abstract phenomena and to demonstrate their impact on the quality of human lives. Students will examine and analyze prepared curricula and will be asked to develop original materials that include provision for the integration of a variety of thinking, reading, and social skills. *Prep. teaching experience or certification.*

51.861 Principles of Programmed Instruction

The development and current status of self-instructional devices. A survey of available programs and teaching machines, with emphasis on the details of the construction and evaluation of programs.

51.870 Developmental Reading and Writing

Reading and writing as the receiving and generating of language; current developmental reading, writing and related language skills; selected research findings bearing on relevant topics. Required of candidates for Master of Education in Curriculum and Instruction: Reading Certification; Curriculum and Instruction: English; Curriculum and Instruction: Language Arts. *Prep. permission of instructor.*

51.871 Reading and Language Disabilities I

Reading and language disabilities; causes and correlates of disability; language differences; aspects of measurement; diagnostic and corrective procedures in reading, writing, and related language skills; selected research findings bearing on relevant topics. Required of candidates for Master of Education in Curriculum and Instruction: Reading Certification; Curriculum and Instruction: English; Curriculum and Instruction: Language Arts. *Prep. 51.870 Developmental Reading and Writing.*

51.872 Literature and Materials Seminar

Literature for children, adolescents and adults; the sources of interest in literature as they relate to the reader; the inter-relatedness of literature and the other components of the language arts program; investigation of materials available. Students will develop projects related to their needs and interests. Required of candidates for Master of Education in Curriculum and Instruction; Reading Certification; Curriculum and Instruction: English; Curriculum and Instruction: Language Arts.

51.873 Reading Clinic I

Practicum in clinical experience. Children and adults with severe reading disabilities will be tutored in the Reading Clinic twice a week for 1½ hours each session, under close staff supervision. A one-hour seminar will follow each tutoring session for purposes of discussion and case presentation. A diagnosis, lesson plans, daily logs, complete case history, and a final progress evaluation will be required of each student. May be taken concurrently with 51.871. *Prep. 51.870 Developmental Reading and Writing.*

51.874 Reading and Language Disabilities II

Second course on Reading and Language Disabilities, including an examination of selected models of language processes; cognitive and affective dimensions; problems in language pathology; and other learning disabilities including academic, perceptual-motor, and neurological areas. *Prep. 51.871 Reading and Language Disabilities I and 51.873 Reading Clinic I.*

51.875 Reading Clinic II

A continuation of the Practicum. Requirements and format will be the same as Clinic I. May be taken concurrently with 51.874. *Prep. 51.871 Reading and Language Disabilities I and 51.873 Reading Clinic I.*

51.876 Teaching Reading in Junior and Senior High School

Developmental or corrective reading programs at the secondary level. Development of reading rate, comprehension, interpretation, study skills, in the content areas.

51.877 Linguistics and Reading

An introductory course in linguistics. The following topics will be examined as applied to the reading process and the teaching of reading: characteristics and systems of natural languages; development of the English language; language acquisition and dialectology. Selected models of language processes will be examined in light of recent linguistic theory. *Prep. 51.871 Reading and Language Disabilities I.*

51.880 Evolution and Revolution in the School Curriculum

Examination of the curriculum of the American school as an expression of conflict between subject-centered and student-centered curricula, traditionalists and revisionists, behaviorism and psycho-dynamism, and the interplay of forces generated by students, teachers, administrators, and other interested groups. Present school curricula will be analyzed as the outcomes of such conflicts, and trends for the future development of school curricula will be hypothesized. *Prep. experience or certification.*

51.881 The Dynamics of Curriculum Design

Identification and analysis of problems in curriculum and instruction in light of the forces affecting the curriculum within the student's area of specialization; design and implementation of solutions to such problems; evaluation, and field-testing where feasible, of these solutions. *Prep. 51.880 Evolution and Revolution in the School Curriculum.*

51.891 Thesis

A research activity that may be elected by the student in lieu of two courses (8 quarter hours,) with the approval and recommendation of the adviser.

51.894 Workshop in Supervision of Instruction (6 quarter hours)

For teachers and other specialists in English, mathematics, science, social studies, and reading in schools and other educational institutions which emphasizes the nature of the supervisory role and appropriate tasks for professional people overseeing the work of other professional people, at all levels of education. The workshop will focus upon the critical role of the relationship between supervisory functions and the quality of the performance and the needs for improvement of the individual being supervised. The supervising professional will be seen as a skilled, experienced, and sensitive person who can oversee the work of others as well as understand a great deal about the curriculum and the specific content, skills, and understandings it embraces and how to communicate these to students. Will include a weekly seminar dealing with matters of a generic nature concerning the nature of supervision at all levels and within the total curriculum of schools or other educational programs and small group seminars in which participants may consider the problems related to more specific content areas and levels and supervised field work.

51.895 Institute in Elementary Education

(see general institute description on page 108.)

51.896 Institute in Secondary Education

(see general institute description on page 108.)

51.897 Workshop in Elementary Education

(see general workshop description on page 108.)

51.898 Workshop in Secondary Education

(see general workshop description on page 108.)

51.899 Directed Study

This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the department. *Prep. approval of the chairman of the department and of the Director of the Graduate School of Education. (Approval forms must be submitted during the quarter prior to registration for the Directed Study.)*

51.900 Cooperative Education in America

An examination of cooperative education as a complex tool for achieving goals of education. Attention will be directed to its psychological implications for the individual, its social implications for the nation, and its place in educational thought. American higher education will be the principal focus of these considerations.

51.920 Methods and Materials in Adult Literacy Education

This introductory course includes a review of current ABE programs around the country with particular emphasis on the programs in Boston, e.g., OIC (Opportunities Industrialization Center), New Urban League, WIN (Work Incentive Program), and public school programs for adults. This review of the programs will include a study and some observation of ongoing programs in the area, especially the WIN program presently being run by Northeastern. Specifically, students will discuss, observe, and study various approaches to ABE programs in terms of curriculum, methodology, materials used, grouping, and evaluation.

A major objective of the course will be to become more aware of the psychological problems of adult readers and nonreaders. Adult behavior and learning will be studied; the effects on learning of particular environmental forces (e.g., black ghetto, Indian reservation, rural-urban factors, etc.); methods of teaching adults, at various levels, will be studied and observed, as will a wide range of currently available books and materials for adult programs. All students may do some supervised clinical work with adults in the Reading and Learning Clinic; logs will be kept on the diagnostic and corrective work developed for each student. *Prep. permission of instructor.*

EDUCATIONAL ADMINISTRATION

52.805 Simulated Problems: Secondary School Administration

The workshop is designed to place each student in a simulated decision-making situation as a principal or administrator of a secondary school. Background materials have been prepared which describe all aspects of a fictitious school system, including its publics, its policies, its certified and noncertified staff members, and its geographical and socio-economic makeup. These background data are disseminated through motion pictures, film strips, and taped interviews with influential people in the fictitious community as well as through written materials. *Prep. 52.810, 52.811 or permission of instructor.*

**52.806 Directed Field Experiences in the Administration
of the Elementary School**

Required of all master's candidates who major in school administration. Study and discussion of administrative functions will be coordinated with selected field

trips to administrative settings and with guest lectures by practicing elementary school administrators. These experiences usually involve visits to such settings as: an elementary school, a middle school, a superintendent's office, a school committee meeting, and appropriate federal and state agencies. In addition, each student will be expected to participate in an administrative field experience in an elementary setting for a minimum of four hours per week. *Prep. 52.810 or permission of instructor.*

52.807 Directed Field Experiences in the Administration of the Secondary School

A companion course to 52.806; required of all master's candidates in school administration. Study and discussion of administrative functions will be co-ordinated with selected field trips to administrative settings and with guest lectures by practicing secondary school administrators. These experiences are aimed at educational agencies at the secondary level and will include visits to a comprehensive high school, a junior high school, a regional vocational-technical school, a superintendent's office, a school committee meeting, and appropriate federal and state agencies. In addition, each student will be required to participate in an administrative field experience in a secondary school for a minimum of four hours each week. *Prep. 52.810 or permission of instructor.* (52.807 may be a continuation of 52.806 or may precede it.)

52.808 Seminar in Educational Administration

A culminating experience for students majoring in school administration at the master's level. A student is confronted with major issues facing the school and its administrators. Great emphasis is placed upon applying knowledge gained in previous administrative courses to an understanding of contemporary educational problems. *Prep. 52.810, 52.811 or permission of instructor.*

52.810 Leadership in Education, Part I

Part one of a two-term core course designed to introduce the student to concepts of formal organization. This core, consisting of a two-part sequence, is prerequisite to further study in the Department of Educational Administration. Part I provides the student with an overview of formal organizations as social systems with emphasis given to the leadership function. Relationships between individuals and organizations are considered. Communications and decision-making functions are analyzed and examined.

52.811 Leadership in Education, Part II

Part II continues an emphasis on the leadership function in organizations. It examines selected informal organization elements such as motivation, normative order, social power, conflict, conformity, and creativity. Attention is given to processes of change and innovation in organizations. *Prep. 52.810 must be completed before enrollment in 52.811.*

52.813 Instructional Leadership: Curriculum Development and Supervision

Views the responsibilities of administrative personnel relating to the improvement of curricular and instructional practices. Evaluative techniques, inservice education, supervisory procedures, and innovative programs are among the

areas of consideration. Opportunities are extended for students to become engaged in supervisory projects individually or in small teams. *Prep. 52.810 & 52.811 or permission of instructor.*

52.814 Simulated Problems: Elementary School Administration

The workshop is designed to place each student in a simulated decision-making situation as a principal or administrator of an elementary school. Background materials have been prepared which describe all aspects of a fictitious school system, including its publics, its policies, its certified and noncertified staff members, and its geographical and socio-economic makeup. These background data are disseminated through motion pictures, film strips, and taped interviews with influential people in the fictitious community as well as through written materials. *Prep. 52.810, 52.811 or permission of instructor.*

52.815 Simulated Problems: Administration of Occupational Education

Each student is confronted with a series of simulated decision-making situations such as those which are usually faced by administrators of programs in the area of occupational education. Readings, audio-visual material, and class interactions all aid in making this experience a most rewarding one.

52.816 Seminar in Career Education

Students will be confronted with a sampling of the major issues facing administrators and supervisors of such programs in their efforts to organize, promote, and operate programs in occupational and career education. Emphasis will be placed on applying the knowledge acquired in previous courses and other program experiences to arrive at a better understanding of contemporary occupational and career education problems and their solutions.

52.817 Design, Production, and Utilization of Instructional Materials

Deals with all aspects of instructional media surveying types, techniques, advantages, limitations, sources and methods of use of materials and equipment in specified areas. Emphasis is on the selection of appropriate media to suit given learning objectives. Laboratory experience in operation of equipment and the production of instructional materials is provided.

52.818 Developing Curriculum Learning Packages

During this course each student will produce a self-correcting, self-pacing, self-directing learning package. Individualized programs currently using the concept of contract learning will be reviewed and evaluated.

52.819 Introduction to Instructional Television

Concerned with operation of an instructional television studio and the production of television programs for direct instruction. Each student will write, direct, and evaluate a short television program in any curriculum field and area of his choice.

52.820 Principles of Programmed Learning

Will cover the development and current status of self-instructional devices and programs. Students will survey available programs and teaching machines, with

emphasis on details concerning construction, selection, evaluation, administration and use of programs.

52.821 Administration of Instructional Media Programs

Addresses itself to the various aspects and problems involved in the management and operation of educational media programs. Public school, university, medical center, commercial, and industrial training program settings are considered in terms of service, instruction, and research.

52.822 Foundations of Instructional Communications and Technology

Introduction to the concepts and principles of the learning process, communications, multi-media instruction and instructional systems. Surveys will include programmed instruction, instructional television, games and simulation, audio-tutorial laboratories, computer-assisted instruction (CAI), computer-managed instruction (CMI), curriculum learning packages, mediated teaching units, individualized instruction, performance contracting, validated instruction, and criterion-referenced testing. Discussion will involve problems of administration and economics of instructional communications and technology in school systems and training centers.

52.823 Principles of Instructional Systems Development

Introduction to the concept of a system as it relates to the instructional process. Each student will select a problem in any area of his choice and conduct a complete systems analysis and systems synthesis to resolve the problem. The contributions of the behavioral sciences as they relate to systems development will also be reviewed.

52.824 Administration of Cooperative Education

An examination of significant elements in the planning, implementation and operation of a cooperative education program. Areas of concern include: agents for institutional change, intra-institutional relationships, program costs and funding sources, cooperative education calendars, development of cooperative work assignments, relationships with cooperative employers, and operational policies.

52.826 Administration of the Elementary School

A survey of the operational tasks performed by the elementary school administrator. Included will be: school-community relations, student personnel, staff personnel, curriculum and instruction, physical facilities, finance and business management, and organizational structure. *Prep. 52.810, 52.811 or permission of instructor.*

52.827 Administration of the Secondary School

A survey of the operational tasks performed by the secondary school administrator. Included will be: school-community relations, student personnel, staff personnel, curriculum and instruction, physical facilities, finance and business management, and organizational structure. *Prep. 52.810, 52.811 or permission of instructor.*

52.891 Thesis

A research activity that may be elected by the student in lieu of two courses (8 quarter hours), with the approval and recommendations of the adviser.

52.895 Institute in Educational Administration

(see general institute description on page 108.)

52.898 Workshop in Administration

(see general workshop description on page 108.)

52.899 Directed Study

This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the department. *Prep. approval of the chairman of the department and of the Director of the Graduate School of Education. (Approval forms must be submitted during the quarter prior to registration for the Directed Study.)*

CAGS COURSE OFFERINGS IN EDUCATIONAL ADMINISTRATION

(Open only to CAGS degree candidates in Educational Administration or by special permission of the chairman of the department granted prior to registration.)

52.830 Current Issues in Educational Administration

A seminar required of all students pursuing the CAGS. Critical and contemporary issues which face school administrators will be examined closely. The status of the administrator; federal, state, and local revenue sources; accountability; the voucher plan; teacher militancy; equal educational opportunity; conflicts with religious organizations; control of schools; urban education problems; cultural deprivation; and human rights are examples of topics that will be analyzed.

52.831 Innovation and Change in American Public Schools

A seminar required of all students pursuing the CAGS. Although major emphasis will be given to curriculum and instruction, attention will also be given to planned change in other critical areas such as team teaching, modular scheduling, nongradedness, educational parks, programmed instruction, in-service education, individualizing education, and teacher-learner relationships.

52.832 The Process of Administration

Simulation, case analysis, and role-playing will be utilized to gain insight into such topics as the improvement of organizational morale, professional job satisfaction, and current issues of involvement and conflict. Alternative courses of action are studied to cope with problematical events confronting educational administrators.

52.834 Educational Finance

The study of school finance deals with the principles and problems of financing education and also considers the basic concepts of economics relative to the place of school finance in the field of public finance. The sources and rationale for public support of schools are examined. Selected state and federal aid programs, capital outlay programs, current practices and issues of local support and bond issue campaigns are included in this study.

52.835 School Business Management

Practices and issues in the administration of school business affairs are the major concern of the course. The role of the school business administrator and the educational budget will be examined. Attention will be paid to principles of budget preparation and development, purchasing, supply management and distribution, school accounting and data processing systems, auditing, financial reporting and management of payroll, transportation programs, school food services, and the operation and maintenance programs for the physical plants. In addition, each student will be placed in a simulated decision-making situation. Background materials have been prepared which describe aspects of a fictitious school system including its publics, policies, and other relevant information. Each student will have the opportunity to deal with matters typically faced by the school business administrator.

52.836 Personnel Administration

The purposes, patterns, and issues in personnel administration are the major considerations of the course. Study will include the skills, attitudes, and knowledge which an institutional staff needs to have and which are essential to the accomplishments of organizational goals. Personnel administration programs and problems of student personnel, para-professional, nonprofessional, and professional staff members will serve as the focus for the course.

52.837 School-Community Relations

This course includes the study and design of school-community relations programs based on the principles and practices of the intercommunications between the school and its several publics. Selected research findings relative to public relations programs in business, industry, and governmental agencies will be reviewed in addition to those involving educational systems. Stress will be placed on the role of the administrator in the development of a comprehensive program of school-community relations for his administrative unit.

52.838 School Plant Planning, Operation, and Maintenance

This course seeks to have the student develop a basic understanding of the processes involved in the planning, maintenance, and operation of school plants. Such items as educational specifications, the process of school construction, techniques used to provide clean, safe and healthy environments for the teaching-learning process along with the selection, assignment and supervision of custodial and maintenance staff will be involved. Statutes or regulations pertaining to these processes used by state and local regulatory bodies will also be reviewed.

**52.840 Problems in School Administration:
A Simulated Experience — The Superintendency****52.842 Problems in School Administration:
A Simulated Experience — Assistant Superintendent for
Instructional Services**

These courses are designed to place each student in a simulated decision-making situation in his area of concentration. Background materials have been

prepared which describe all aspects of a fictitious school system including its publics, policies, certified and noncertified staff members, and the geographical and socio-economic makeup of the community. These background data are disseminated through motion pictures, film strips, and taped interviews with influential people in this community as well as through written materials.

52.843 Administrative Internship

This is an individualized offering involving supervised observations, internships, and externships in educational administration and it is designed to provide further practical experience in the student's area of administrative preparation. The administrative internship program must be worked out well in advance with the adviser.

52.844 School Law

The student will be expected to develop a basic understanding of federal and state laws that apply to school systems, educational programs, and personnel as well as of the legal prerogatives available to the practicing administrator and the local boards of education. This study will include consideration of the constitutional, statutory, and common-law foundations of educational systems and the school administrator's role with respect to them.

52.845 Seminar in Media Research and Learning

Provides for surveys, critical analyses, and discussions of current research dealing with learning principles, communication theory, media, and instructional systems design. Oral and written reports are required. Experimental and field research are considered for additional credit in subsequent terms.

52.846 Developing Curriculum in Learning Packages — Advanced

Using the instructional development techniques acquired in the introductory course, students will design a more sophisticated learning package, field test it, and using the test data, revise the package until the predetermined criteria are met.

52.847 Cataloguing and Classification of Instructional Materials

The principles, codes, and techniques utilized in organizing both print and non-print materials in an integrated collection. Emphasis on the application of bibliographic methods of control to films, records, slides, cassettes, kits, and other media. Acquaintance with the sources and tools listing instructional materials for the purpose of ordering them and the development of the skill which assists the user in locating them.

52.860 Academic Administration in Higher Education

Recruitment of properly qualified faculty and staff is only one problem of the academic administrator. This course will also consider the problems of: pupil services, admissions, athletics, curriculum development, accreditation, instructional resources, registration and scheduling, faculty organization, continuing education, faculty rights and responsibilities, and personnel policies.

52.861 Problems in College Administration: A Simulated Experience

This seminar is designed to place each student in simulated decision-making situations as an administrator of a college or junior college. Background mate-

rials have been prepared which describe all aspects of a fictitious college including its policies, make-up of faculty and student body, its financial situation, the community it serves, and its board of control. These data are disseminated through motion pictures, film strips, and taped interviews with fictitious people as well as through written materials.

52.862 Institutional Planning and Facilities

This course will consider the planning of new colleges as well as the expansion and maintenance of existing ones. Systems analysis, needs surveys, and development of educational specifications for college facilities will constitute half of the course. The other half will involve the operation and maintenance of the physical plant including provisions for housing, safety, parking, communications, and health service.

52.863 Financial Management in Higher Education

This course seeks to combine a knowledge of fund-raising activities with the study of proper financial management in higher educational institutions. The problems of fund raising for both public and private, two- and four-year institutions will be considered. Modern techniques of budget preparation and control will include purchasing, school accounting, data processing, providing benefits for faculty, financial reporting, food services, housing, and operation and maintenance of physical plant.

52.864 Typologies of Higher Education

A study of the types of higher educational institutions, with emphasis on organizational structure, modes of governance, and administration. The history of higher education, particularly the development of colleges, universities, and junior colleges in the United States, will be considered to provide perspective for the modern college administrator. Important issues and the problems they presented for administrators will provide the major focus of this course.

52.865 Systems Theory in Education

A course open to all students pursuing the Certificate of Advanced Graduate Study. This course will provide the student with an introduction to general systems theory and the implications of systems theory to leadership, administration, and supervision. The course will include examination of systems applications such as PERT, PPBS, and flow chart development. Special consideration will be given to systems study as a method of planning and evaluation.

52.866 Politics and Educational Decision Making

This course examines federal, state, and local governmental arrangements and political processes which influence educational policies of school systems. Emphasis is given to the application of political science concepts and research methods to educational policy-making processes and to the political environment surrounding the educational administrator.

52.899 Directed Study

This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the department. *Prep. approval of the chairman of the department and of the*

Director of the Graduate School of Education. (Approval forms must be submitted during the quarter prior to registration for the Directed Study.)

COUNSELOR EDUCATION

53.800 Foundations of Guidance and Human Services

A philosophically-, theoretically-oriented course dealing with the current social context of the "counter-culture," the nature of humanness, and the relation of these two aspects to guidance services in schools and human services in other educational and community settings. Course procedures will emphasize the development of student self-understanding and increased awareness of social and institutional structures and their effect on human beings. The helping person as an agent of social and institutional change will be the focus of the latter half of the course.

53.801 Tests and Test Procedures

The principles and problems of psychological testing as applied to the work of the counselor are discussed. Some consideration is given to technical concepts as they apply to the treatment, use, understanding, and interpretation of test scores. The student is made familiar with some of the currently used tests of intelligence, scholastic aptitude, differential aptitudes, achievement, interest, and personality. Tests are evaluated for use in education and guidance. Problems of test interpretation are emphasized.

53.802 Vocational Development and Occupational Information

A dual-emphasis course dealing, first, with theories about how individuals make decisions concerning their choice of vocation, and second, with the kind of data which is needed to assist people with these decisions. This requisite data deals with the following areas: the relationship of social and economic change to occupational trends; the classification and description of occupational fields; methods of collecting, evaluating, filing, and disseminating vocational information; and the role of the counselor in fulfilling these functions.

53.804 Counseling Theory and Process

A required course for all Counselor Education degree candidates which must be taken in the Fall Quarter concurrently with the beginning of Practicum. The course will provide the student, through self-instructional materials, with a basic cognitive understanding of several major theoretical approaches to counseling. Classroom content will help the student to become familiar with a wide range of individual counseling strategies; to develop listening, understanding, and communications skills; and to further probe his own self-understanding as a counselor. These skills and understandings will be discussed and simulated in the context of a variety of settings with a variety of clients. Role playing, case material, and audio and video materials will be utilized in the instruction. This course will not be open to special students, but may be elected by degree candidates in other departments.

53.805-53.806 Counseling Practicum

(8 quarter hours)

The counseling practicum is a supervised counseling experience extending over the academic year. Although registration for this course occurs only during the

Winter and Spring Quarters, students will actually begin their practicum in the Fall Quarter. Emphasis in the fall will be on small group seminars dealing with counseling and other related matters. The Winter and Spring Quarters will concentrate on the supervised counseling assignment. Assignment to practicum settings will be made according to the student's major area of concentration. Students must make themselves available a minimum of one and a half days per week for the academic year (October to June) for placement in a field setting. Seminars will stress material germane to the student's major and will meet a total of 24 times during the year.

Part-time students must submit an application for practicum (available from the Department) by March 30 for approval to enroll in the practicum the following Fall Quarter. *Prep. 53.800 Foundations of Guidance and Human Services and 53.804 Counseling Theory and Process, both of which may be taken concurrently with the beginning of Practicum.*

53.807 Administration of Guidance Services

An advanced level guidance course designed to help meet the certification requirements for guidance directors in Massachusetts. The course will cover philosophies, principles, and methods of establishing and administering guidance programs in the public schools. Simulated materials are used to replicate actual guidance problems dealing with testing programs, budgeting, interpersonal relationships, and other practical matters.

53.808 Group Counseling

An introduction to theory, principles, and techniques of counseling with groups of individuals at different levels of development and for varying purposes. A basic mode of approach will be to involve students in a genuine group counseling experience in order to understand the phenomenon of group experience. *Prep. 53.804, Counseling Theory and Process or permission of instructor.*

53.809 The College Student and His Campus

The relationship between college students and their environment will be examined. Focus is on student rights, emotional concerns, and the search for identity. The impact of societal forces and nontraditional patterns of study on student behavior are stressed. Varying concerns of personnel services in different types of college climates, including the community college, are discussed. Current issues in higher education are examined as they relate to services to students.

53.810 Elementary School Guidance

Required for elementary counseling majors, this course has three principal objectives: 1) to gain a theoretical understanding of the personal, social, academic, and vocational development of children between the ages of 5 and 12 years; 2) to conceptualize the roles, functions, and goals of the elementary school counselor; and 3) to begin to consider a variety of programmatic strategies to operationalize the goals of the elementary school counselor. Topics to be studied include values clarification, decision-making, developmental guidance, major theoretical approaches to development, the issue of exceptionality, occupational information and vocational development, and confluent education. These

topics are set in the context of the elementary school counselor's role as a counselor/consultant/coordinator for the total elementary school population.

53.811 Family and Parent Counseling

The family will be studied as an institution, as an arena of interpersonal transaction, and as a seed-bed both of distress and of health. Various modes of counseling families will be presented, together with the theoretical notions underlying their use. The course will also demonstrate counselor-parent relations in the context of the school setting. *Prep. 53.804, Counseling Theory and Process or permission of instructor.*

53.812 Seminar in Student Personnel Work

Relevant topics and cases for personnel workers and administrators in higher education will be discussed and studied in depth. The expertise of appropriate specialists will be utilized.

53.813 School Counseling Strategies

Intended primarily for students who will counsel in school settings or other settings emphasizing work with children and adolescents. A broad range of approaches will be considered, including but not limited to, behavior modification, Gestalt and Adlerian strategies. Special emphasis will be placed on the development of strategies designed to help alleviate typical school-related and developmental problems such as nonachievement, decision-making, negative self-identity, and disruptive behavior. Consideration will also be given to the counselor's role as a consultant to teachers, parents, and administrators in effecting positive behavior change. *Prep. 53.804 Counseling Theory and Process.*

53.814 Vocational Counseling Strategies

Develops an understanding of the essential ingredients of a self awareness program especially in relation to a person's role expectations in the world of work. Vocational counseling is viewed as dealing with the entire individual including his values, underlying psychological needs and drives, and the influence of the environment on one's present level of development and career awareness. Other topics to be developed in this course will include counseling with females, with nonachievers, the decline of the work ethic, community resource development, job placement, and information giving as a perceptual process. *Prep. 53.804 Counseling Theory and Process. The course is intended for a variety of client populations from adolescence through adulthood.*

53.815 Rehabilitation Counseling Strategies

Primary emphasis will be on the roles and functions of the rehabilitation counselor, relevant issues in the field, and an overview of the rehabilitation process. Special problems and techniques of counseling with the disabled (physical, mental, and behavioral disorders) will be examined through case studies and role playing. Disability in the context of social deviance will be discussed, and psycho-social approaches in understanding human behavior, including self-concept, social role theories, and rational-behavioral approaches, will also be examined. *Prep. 53.804 Counseling Theory and Process. (This prerequisite is waived for Rehabilitation Administration majors.)*

53.816 Psychological Counseling Strategies

Focuses on a variety of strategies designed to alleviate problems of older adolescents and adults. Perceptual-Gestalt insight approaches, and behavioral approaches to counseling will be analyzed for their effectiveness with a variety of psychological problems. The context for considering this eclectic approach to psychological counseling will be communications theory and organizational psychology, with the latter being related to the effective delivery of counseling and mental health services. *Prep. 53.804 Counseling Theory and Process. This course is primarily intended for the student working with client populations in mental health settings and college counseling centers.*

53.818 Case Studies in Marriage and Family Counseling

An advanced level course for students with previous experience or preparation in marriage and family counseling. Skills to be emphasized will include 1) the preparation of case studies of family and marriage histories and current functioning; 2) the design of service, counseling, and referral programs based upon comprehensive studies of needs and resources; and 3) the practice of counseling strategies through role playing, taped interviews, and progress reports of current counseling activities. *Prep. 53.811 Family and Parent Counseling*

53.824 Individual Intelligence Testing

(6 Quarter Hours)

Preparation to administer, score, and interpret the Stanford-Binet Intelligence Test, the Wechsler Adult Intelligence Test, and the Wechsler Intelligence Scale for Children. Consideration will be given to the theories of intelligence upon which the tests are based and the use of the tests in educational and clinic settings. Students will be required to administer and score 30 tests including some from each of the three tests included in the course. *Prep. 53.801 Tests and Test Procedures or permission of instructor.*

53.831 Advanced Group Counseling

This course will be a continuation of the content presented in Group Counseling, placing greater emphasis on developing skill in conducting group counseling at a variety of age levels. Greater attention will be given to relevant readings and research on group process and methods for behavior modification. *Prep. 53.808, Group Counseling or permission of instructor.*

53.833 Seminar in Counseling Supervision and In-Service Education

Supervisory methods of improving the effectiveness of school counselors' skills in counseling and other aspects of guidance work, of involving counselors in the improvement of the guidance program, and of enhancing the personal growth of the counselor. *Prep. master's degree in guidance or permission of the instructor.*

53.834 Advanced Theories of Behavior Change

An advanced level counseling course required of all CAGS students and designed to provide greater depth of cognitive understanding of a variety of approaches to counseling. Original readings from a number of major theorists will be required. A major goal of the course will be to identify the major similarities and differences of assumptions, goals, and strategies of the theorists

studied and to build a strong conceptual basis for a counseling eclecticism from this analysis. Some of the theorists studied will include Freud, Adler, Perls, Ellis, Glasser, Rogers, Sullivan, May, Frankl, Bandura, and Skinner. *Prep. at least two counseling courses emphasizing both theory and process.*

53.835 Psychodiagnostic Measures

An advanced level course in the use and interpretation of interest and personality measures for more clinically oriented settings. The course will place heavy emphasis on the case study method. Some of the tests typically studied in this course may include the Minnesota Multiphasic Personality Inventory, the California Psychological Inventory, Edwards Personal Preference Schedule, the Semantic Differential, and various interest measures. The course will introduce the student to projective techniques beginning with the sentence completion test. *Prep. 53.801, Tests and Test Procedures; Abnormal Psychology or Personality Theory; and permission of instructor.*

53.836 Systems Approach to the Development of Human Services

Concepts and techniques of systems analysis will be applied to the development, management, delivery, and evaluation of human services in schools, colleges, and mental health and rehabilitation systems. Students will be taught the skills of analysis and synthesis of problems, writing goals and objectives, PERT charting, and flowcharting. These skills will be applied to problems of the student's choosing. This course stresses applications of systems techniques rather than systems theory. Only those concepts necessary to the understanding of the skills will be emphasized.

53.840, 53.841 Advanced Field Work

(8 quarter hours)

Required of all CAGS students. The student will be assigned a field work placement consistent with his major professional goal and/or the setting in which he intends to work. The activity of the field work will extend across the academic year from September to June and require a minimum of one and a half days per week, or the equivalent, in the field work setting. Seminars will meet on alternate weeks with additional individual supervision on campus. Supervision will also be provided in the field setting. Both quarters must be completed before credit will be given for the course. *Prep. Counseling Practicum or the equivalent in experience.*

53.891 Thesis

A research activity that may be elected by the student in lieu of two courses (8 quarter hours), with the approval and recommendation of the adviser.

53.895 Institute in Counselor Education

(see general institute description on page 108.)

53.898 Workshop in Counselor Education

(see general workshop description on page 108.)

53.899 Directed Study

This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the Department. *Prep. approval of the chairman of the department and of the Director of the Graduate School of Education. (Approval forms must be submitted during the quarter prior to registration for the Directed Study.)*

REHABILITATION ADMINISTRATION AND SPECIAL EDUCATION

Rehabilitation Administration

50.950 Introduction to Rehabilitation

An overview of and orientation to the field of rehabilitation, including its historical development, legislative involvement, psychological implications, and sociological dimensions. Emphasis is placed on coordinating and integrating services as they relate to the field of rehabilitation as a community process.

50.951 Principles of Medical Rehabilitation

The wide spectrum of disabilities that could profit from rehabilitation, including orthopedic, neurological, medical, surgical, and mental disabilities. Basic principles of medical rehabilitation important for the administrator to know will be presented. Psychological aspects of disability will also be discussed.

50.952 Rehabilitation and Social Services

The use of vocational rehabilitation as an effective rehabilitation process in federal, state, and private agencies as supported and encouraged by the most recent social and rehabilitation services legislation. This will include use of the rehabilitation model in programs for the physically handicapped, mentally retarded, emotionally disturbed, aging, welfare populations, youthful offenders, culturally disadvantaged, and other special community programs. There will be emphasis on the administrative involvement in developing and supporting the diagnostic, evaluative, counseling, and placement procedures used in such rehabilitative programs.

50.953 Organization and Administrative Theory

The body of conceptual knowledge regarding organizational and administrative theory will be examined. Formal and informal organizations, organizations as social systems, status and role concepts, leadership in organizations, power structure, relationships to authority, decision-making, and communication in and between organizations. An organizational analysis will be made of all the different types of rehabilitation settings currently in use.

50.956 Community Planning in Rehabilitation

What the administrator needs to know about community planning to plan a program in his area. Basic principles of community planning, community organization, and community dynamics, as well as interdisciplinary relations in rehabilitation. Examples of community planning from different rehabilitation agencies and the referral process among these agencies will be studied.

50.957 Federal-State Relations in Rehabilitation

The complex network of federal-state relations and their implications for rehabilitation. Grant procedures, matching formulas, public relations and VRA directives, state and federal legislation pertinent to rehabilitation.

50.958 Social Welfare and Rehabilitation

Acquainting rehabilitation administrators with the broad field of social welfare. The course will review the historical backgrounds of the relationship between vocational rehabilitation and social welfare and the more recent fast-moving developments in the relationship of these fields.

50.959 Rehabilitation Research

The emphasis in this course will be on administrative research, program evaluation, grantsmanship, etc. In addition, students will have the opportunity to develop a research design on some aspect of rehabilitation administration and carry out the necessary research operations involved.

50.960 Practicum in Rehabilitation Administration (8 quarter hours)

Students will be assigned to a variety of rehabilitation agencies for their practicum experience. Problem-solving relevant to experiences encountered in internship. A seminar will be regularly conducted by a senior faculty member in conjunction with the practicum experience. This seminar will enable students to share their field work experiences and resolve problems in rehabilitation administration which are connected with their field placements.

50.961 Rehabilitation Administration I

An in-depth study of management practices within a rehabilitation organization from a behavioral stand-point. Areas to be covered include need surveys, goal setting practices, job descriptions, recruitment, staffing, training, professional development, caseload management, program planning, utilization of research, community relations, leadership patterns, performance appraisal, and external relationships. Special cases will be used in classroom exercises.

50.962 Administration of a Sheltered Workshop

Special problems of administering a sheltered workshop, such as community planning, work evaluation, job-training, labor relations, contracting, production, and occupational placement.

50.963 Rehabilitation Administration II

Understanding the fiscal management of the typical rehabilitation setting including basic rehabilitation agency accounting, planned program budgeting, disbursements, cost-analysis, contracting, taxation, forecasting, and funding. The implication of data processing for fiscal management will be covered in the course. Special problems will be assigned during the course.

50.964 Rehabilitation and the Law

This course is designed to sensitize rehabilitation administrators to the impact of legislative developments upon the field of rehabilitation. Special emphasis will be placed on understanding the legal implications for rehabilitation of the latest Vocational Rehabilitation Administrative Amendments, workmen's compensation laws, eligibility determination criteria, and Social Security Amendments.

50.965 Occupational Placement

A study of the dynamics of moving the rehabilitation client into the world of work within the framework of the specific community structure. Development of facility in use of resource materials in occupational information, job description and analysis, performance appraisal, training, and vocational assessment. The personnel point of view toward the handicapped will be discussed and analyzed, and more effective placement practices will be developed.

50.980 Psychological Problems of Disability

In depth study of the disabled from the viewpoint of psychosocial factors, interpersonal relationships, and cognitive versus noncognitive functioning in those with motor and sensory disabilities; problems of dependency and motivation.

50.981 Administrative Problems in Rehabilitation

Seminar designed to analyze in depth critical issues and selected rehabilitation problems. Operations and systems research as applied to rehabilitation will be highlighted. Students will make use of institute research studies and studies available through Social and Rehabilitation Services completed research and demonstration projects.

50.982 Essentials of Case Management and Supervision

The relationship between case management and casework supervision will be explored. Topics covered will be dynamics of the communication process, decision-making, conflict, resolution and compliance, management of resources external to the organization, and structural and functional analysis of supervisory process. Management of case load.

50.983 Rehabilitation of the Alcoholic and Drug Dependent

A study of comprehensive factors including the nature of etiology dynamics involved in alcoholic and drug dependency; techniques for evaluation; rehabilitation administration, planning, and treatment.

50.984 Rehabilitation of the Penal Offender

The rehabilitation of the penal offender will be examined from an eclectic point of view. Psychodynamic elements will be stressed as well as social factors in the etiology, evaluation, treatment and rehabilitation seminar planning and administration.

50.985 Rehabilitation of the Geriatric

This course will present a comprehensive treatment of the problems, dimensions, and parameters involved in the administration of the various services and facilities for the rehabilitation of the geriatric. Special emphasis will be placed on the rehabilitation philosophy versus disengagement.

50.986 Critical Issues in Rehabilitation Administration

This course will be built around the exploration and in-depth discussion of current issues which are highly problematical to the field. Among these issues are the breadth of the concept of disability, appropriate training sequences for the various rehabilitation disciplines, the resolution of conflict over role overlap among disciplines, appropriate models for service delivery systems, etc. The most current and relevant research will be brought to bear upon these areas as well as knowledge from the reservoir of experience of instructors, visiting experts, and the student participants themselves. Students will be prepared to cope with these issues as they exist in the profession and in the community. A theoretical orientation frame of reference will be brought to bear upon problems wherever feasible.

50.991 Thesis

A research activity that may be elected by the student in lieu of two electives (8 quarter hours), with the approval and recommendation of the adviser.

50.995 Institute in Rehabilitation Administration

(see general institute description on page 108.)

50.998 Workshop in Rehabilitation Administration

(see general workshop description on page 108.)

50.999 Directed Study

This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the department. *Prep. approval of the chairman of the department and of the Director of the Graduate School of Education. (Approval forms must be submitted during the quarter prior to registration for the Directed Study.)*

Special Education

(For sequence requirements refer to Fields of Study.)

55.801 Special Education for the Regular Classroom Teacher

This course is designed as an introductory course for students and for teachers in the field to consider the nature and needs of exceptional children. Educational adjustments which will need to be made both in and out of the regular classroom are given major emphasis. The roles of the regular class teacher, the resource teacher, and other remedial specialists will be examined, and uses of the team approach will be explored.

55.807 Learning Disabilities

Survey of characteristics of children who possess adequate mental ability, sensory processes, and emotional stability but who present specific deficits in perceptual, integrative, or expressive processes which impair learning efficiency. An overview of diagnostic tests, the reading process, curriculum materials, and teaching methods combined with observation and practice in clinical diagnosis and prescription.

55.831 Teaching the Emotionally Disturbed

A study of approaches used to deal with disruptive behavior. Curriculum and facilities adjustments and techniques of classroom management are also considered. *Prep. 55.880 Developmental Aspects of Physical, Mental, and Emotional Dysfunction (may be taken concurrently with 55.880).*

55.832 Group Dynamics

Emphasis on understanding group growth, behavior, and action fundamental to developing solutions to the complex problems of group life. Students will learn to examine their strengths and weaknesses, to make decisions, to become alert to new ideas and actions, to discover the pulse of a group, and analyze reasons for being productive while another group may be nonproductive. The group will examine such areas as sociodrama, sociometric techniques, attitude testing, social action project development, and communication blocks in human relations.

55.833 Mental Health

A study of conditions leading to optimal social adjustment. Consideration of the relationship between the maturation process and mental health, possible predeterminants of maladjustment, and factors which encourage the attainment of emotional maturity. Special emphasis will be paid to the role of the school. Contributions from the fields of psychiatry, psychology, sociology, physiology, and medicine will be synthesized and evaluated.

55.834 Case Conferences on Emotionally Disturbed Children

This course will be conducted as a seminar in connection with the student's practicum. Case presentations by outstanding resource persons will be thoroughly examined and discussed. Students will also be expected to make their case presentations to the seminar. *Prep. 50.807 Abnormal Psychology, 55.831 Teaching the Emotionally Disturbed.*

55.835 Socio- and Psychodynamics of Family Life

A consideration will be given to the internal and external dynamics of family life and the significance of such dynamics to the mental health of the handicapped child. Approaches to working with parents are explored.

55.837 Seminar: Problems of the Emotionally Disturbed Child

This course will be devoted to an intensive study of the special problems of the emotionally disturbed child. It will provide an opportunity to proceed in depth in areas of special interest to the seminar students. Special attention will be paid to problems presented by the autistic child, the neurotic child, the child with character disorders, the child with psychosomatic disorders, and the multihandicapped child. *Prep. 55.880-881 Developmental Aspects of Physical, Mental, and Emotional Dysfunction.*

55.839 The Multiply Handicapped

A review of handicapping conditions and consideration of the educational implications of multiple handicaps. Tutoring a child with two or more handicaps, consulting with agencies and school personnel will be among projects assigned. *Prep. Either 55.880 Developmental Aspects of Physical, Mental, and Emotional Dysfunction or 55.840 Psychology of Mental Retardation and Other Handicapping Conditions, or permission of the instructor.*

55.840 Psychology of Mental Retardation and Other Handicapping Conditions

A study of the social and emotional adjustment of handicapped children and of the psychological significance of mental, sensory, and motor variations in the adjustive process. The effects of limitations imposed by attitudes of society, the attitude of the individual toward his handicap, and the effect of the handicap itself are evaluated. Implications for educational programs are analyzed.

55.841 Methods and Materials — Trainable Retarded

Approaches and techniques utilized in working with the severely handicapped.

55.842 Methods and Materials — Educable Retarded

Techniques used in special education to provide for assessment, diagnosis, and prescriptive teaching for the educable retarded and other mildly handicapped pupils. Roles of the learning specialist, resource teacher, and the regular class teacher will be examined.

55.843 Industrial Arts and Crafts and Vocational Education for the Handicapped

Designed to develop fundamental skills in the teaching of basic arts and crafts and home management, and in projects assigned in such areas as: use of tools for simple projects, household repairs, basic sewing, and essentials of food preparation. Visits are made to sheltered workshops and vocational adjustment centers.

55.844 Measurement and Evaluation in Special Education

Emphasis on the assessment of abilities of handicapped children and interpretation of test results. Demonstrations of the WISC, the ITPA, and other frequently used diagnostic tests. Emphasis is on interpretation of test results for educational remediation. *Either 55.840 Psychology of Mental Retardation and Other Handicapping Conditions or consent of instructor.*

55.845 Rehabilitation for Special Education Teachers

The course is designed to assist in developing effective working relationships between vocational rehabilitation counselors and special education teachers through exposure of the two groups to a number of similar experiences. Elementary and secondary school personnel concerned with exceptional children will also find the course valuable. Consideration will be given to present legislation, the teacher's role in vocational rehabilitation, an understanding of the counseling process, and vocational rehabilitation resources available to school personnel.

55.848 Identification of Preschool Learning Problems

Consideration and evaluation of tests and procedures currently in use for the purpose of evaluating preschool children in areas of physical, perceptual, and intellectual functioning. Clinical experience will be an integral part of the course and work with parents will be emphasized. *Prep. 55.844 Measurement and Evaluation.*

55.849 Special Education for Gifted Children

Identification, characteristics and problems of gifted, creative, and talented children and youth. Emphasis on administrative and instructional adjustments needed to provide for this group of exceptional children.

55.850 Field Work and Seminar

55.851 Student Teaching of the Emotionally Disturbed (4 quarter hours each) Courses designed to satisfy Massachusetts certification requirements for teaching, under clinical supervision, children designated as emotionally disturbed. The courses extend over a full year in a series of experiences as participant observer, tutor, and teacher. Students must make available a minimum of 2 days per week for the first 2 quarters and 5 full days per week for the 3rd quarter. Part-time students who are employed will need to make provision for evening, weekend, or summer assignments to satisfy the field experience, and to satisfy the student teaching requirement, 5 days per week. Provision for attendance at seminars must also be made.

55.853 Field Work and Seminar**55.854 Practicum in Special Education**

(4 quarter hours each)

Courses designed to satisfy Department requirements for field experience and extended practicum for SECP or other students who do not need certification. The courses extend over a full year and cover a series of experiences. Students must make available a minimum of 2 days per week for the first 2 quarters and 5 full days per week for the 3rd quarter. Application for field placement is made 2 quarters prior to that for which field work is planned. Part-time students who are employed will need to make provision for evening, weekend, or summer assignments to satisfy the requirement for field experience, and a full quarter of field work, 5 days per week. Provision for attendance at seminars must also be made.

55.855 Field Work and Seminar**55.856 Student Teaching of the Mentally Retarded**

(4 quarter hours each)

Courses designed to satisfy present Massachusetts certification requirements for teaching children designated as mentally retarded. The courses extend over a full year in a series of experiences as participant observer, tutor, and teacher. Students must make available a minimum of 2 days per week for the first 2 quarters and 5 full days per week for the 3rd quarter. Part-time students who are employed will need to make provision for evening, weekend, or summer assignments to satisfy the field experience, and to satisfy the student teaching requirement, 5 days per week. Provision for attendance at seminars must also be made.

55.870 Administration and Supervision of Special Education

Designed for advanced graduate students preparing for administrative or supervisory positions in special education programs. Facilities and curriculum adjustments, staff roles, methods and content for in-service training, and the use of the team approach are studied. Field trips to observe and evaluate programs are required. *Prep. 52-810, 52-811 Leadership in Education I & II.*

55.880, 55.881 Developmental Aspects of Physical, Mental, and**Emotional Dysfunction**

(8 quarter hours)

The etiology, dynamics, diagnosis, and treatment of physical and mental anomalies and of emotional disturbance in children with special reference to their influence on learning. The nature and role of concerned agencies are discussed and emphasis is placed on the multidisciplinary approach for life-span planning. This course meets two consecutive quarters. *Prep. 50.803 Child Psychology (may be taken concurrently during the first quarter).*

55.882 Seminar in Mental Retardation

A study of research in the field and its implications for teaching. Intervention strategies will be studied and evaluated.

55.891 Thesis

A research activity that may be elected by the student in lieu of two courses (8 quarter hours), with the approval and recommendation of the adviser.

55.895 Institute in Special Education

(see general institute description on page 108.)

55.898 Workshop in Special Education

(see general workshop description on page 108.)

55.899 Directed Study

This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the department. *Prep. approval of the chairman of the department and of the Director of the Graduate School of Education. (Approval forms must be submitted during the quarter prior to registration for the Directed Study.)*

SPEECH PATHOLOGY AND AUDIOLOGY

55.803 Cerebral Palsy

Neuromuscular involvements and concomitant language and speech disorders; intellectual deficits, psychological deviations, communicative disorders of a cerebral palsied population; testing, placement, and management of the cerebral palsied child and adult with emphasis on a multidisciplinary approach.

55.804 Aphasia

Emphasis on clinical analysis of aphasic verbal behavior, physiology and pathology of aphasia, review of literature, and a brief review of current attitudes concerning therapy.

55.805 Seminar: Voice Disorders

Physiology and neurology of the laryngeal mechanism; the laryngoscopic examination. Voice disorders as learned behavior as a result of organic, neurological, and psychological deviation. Evaluation, referral, and management.

55.806 Language Disturbances in Children

Minimal cerebral dysfunction and its effect on language acquisition and use in the communicatively disturbed child; behavioral patterns of the nonverbal child; concepts of delayed development of language; evaluation and management.

55.811 Clinical Management in Stuttering

This course will emphasize diagnostic techniques, a review of the current therapeutic approaches, consideration of the individual's needs in therapy and the process of behavioral and attitudinal change. Also to be considered are termination, referral, and group therapy.

55.812 Differential Diagnosis in Speech and Language Pathology

Evaluation, interpretation, and integration of test results; the application of standard psychological tests to speech and hearing disorders; analysis of patients' premorbid and morbid histories, medical and psychological diagnoses; design and execution of therapeutic procedures; proper referral techniques and report writing; practicum situation. *Prep. 55.816, Test Procedures in Speech and Language or permission of instructor.*

55.813 Advanced Clinical Practice

(8 quarter hours)

Supervised clinical practicum in speech pathology and audiology in the North-eastern University Speech and Hearing Clinic and medical settings, educational settings, and rehabilitation centers. A minimum of 150 clock hours of experience

with patients is required, to extend over a three quarter time period. An "I" grade will be awarded until all the requirements are met and then a pass-fail grade will be awarded. *Prep. 50 clock hours of clinical experience and permission of the clinical staff.*

55.814 Clinical Audiometry I

The use of pure tone and speech reception instrumentation and hearing aid evaluation, the results and interpretation in the diagnosis of functional and organic disorders. Lectures, demonstration, observations, and practicum. *Prep. Introduction to Audiology and consent of instructor.*

55.815 Clinical Audiology

The process of identification and evaluation of hearing loss. Differential diagnosis. Tests for conductive, sensorineural, and retrocochlear involvements. A consideration of research findings in the area of hearing aid selection, auditory training, lip reading, and language training for hearing handicapped individuals. *Prep. Introduction to Audiology (see undergraduate Education catalog).*

55.816 Test Procedures in Speech and Language Pathology

Procedures in evaluating organic and functional communication disorders using standard and nonstandard speech and language tests in University clinic situations. Demonstration and application of techniques, and objective reporting.

55.817 Advanced Anatomy, Neurology, and Physiology of Speech-Hearing Mechanism

Lectures and demonstrations by medical personnel. Emphasis on the head and neck. Admission by consent of adviser and medical supervisor. For advanced standing students. *Prep. Anatomy, Neurology, and Physiology of Speech and Hearing I; Introduction to Audiology, and Pathologies of the Ear.*

55.818 Pathologies of the Ear

Lectures and observations in the organic and neurological pathologies of the ear; i.e., otitis media, Meniere's disease, and otosclerosis. Consideration of approaches to treatment (medical setting).

55.819 Clinical Audiometry II

Specialized techniques (Bekesy, FGSR, EEG, group testing, and screening) the results and interpretation in the diagnosis of functional and organic hearing disorders. *Prep. Introduction to Audiology and Audiometry I, lectures, demonstration, observations, and practicum.*

55.820 Physiological Acoustics

Particular emphasis is placed on the biophysics of the hearing mechanism, especially in terms of actual clinical utility. Comparative anatomy and physiological analysis and dissections will accompany many of the class lectures. *Prep. Introductory courses in Speech and Hearing, 55.815 Clinical Audiology.*

55.821 Seminar in Audiology

Advanced study of the rationale and development of principles associated with special procedures and methods used in audiology.

55.822 Seminar in Oro-facial Anomalies

Course material will be presented via lectures, class discussions, and frequent visits to and participation in several plastic surgery clinics. Guest lecturers in the areas of plastic surgery, genetic counseling, and otolaryngology will be invited to participate in the course. Major content areas will be embryology, etiology, cleft lip and palate, and other syndrome classifications, speech and language considerations, surgical, dental, and otologic considerations, psychological and social considerations, and an analysis of the total team rehabilitative effort. *Prep. Anatomy and Physiology of the Speech Mechanism.*

55.823 Psycho-social Aspects of Communication Disorders

This course is concerned with the psychological and social aspects of organic and nonorganic communication disorders. It will include personality dynamics in aphasia, cleft palate, cerebral palsy, deafness, and other primarily organic disorders, and psychogenically motivated disorders such as stuttering, language, and articulation.

55.824 Seminar in Speech Pathology

Individual research and/or critical review of the literature in some area of basic science, speech sound learning, language, voice, fluency, or multiple disorders. Class presentations of material and class discussion will be included. *Prep. open to graduate students who have completed the equivalent of two quarters of graduate work in Speech Pathology and who have permission of the instructor.*

55.860 Aphasia Rehabilitation

Emphasis on current attitudes toward therapy and new methods, clinical methods of evaluation which are preparatory to therapy, observation of therapeutic methods, and supervised clinical practice at the Veterans Administration Hospital. *Prep. 55.804, Seminar: Aphasia or an acceptable equivalent.*

55.861 Neuropathology

The intricacies of neurological disease. Application of functional neuroanatomy in comprehending the various disease processes involving the nervous system. Derangements of speech with a neurological basis, an understanding of the disease process in relation to the diagnosis and treatment of patients with neurological diseases: cerebrovascular disease tumors or malformations, Parkinson's disease, multiple sclerosis, and others. Case presentations, neuroanatomy, laboratory experience, and analysis in the hospital environment. *Prep. permission of instructor.*

55.862 Psycho-acoustics

Particular emphasis will be placed on masking, frequency vs. intensity relationships, evoked response procedures, brieftone and temporal integration, binaural summation, impedance foundations, and general behavioral responses to sound stimuli. *Prep. Introduction to Speech and Hearing, 55.815 Clinical Audiology, 55.820 Physiological Acoustics.*

55.863 Advanced Study in Articulation Disorders

An exploration into advanced theories of normal and abnormal phonological development with emphasis on distinctive feature theory and phoneme theory;

direct application of theories to diagnosis and treatment of various phonological disorders.

55.864 Parent Education in Communication Disorders

This course is designed to develop the student's understanding of the role of the parent in the therapeutic process. Content of the course includes various approaches to parent education, including group therapy, client-centered counseling, and filial therapy. *Prep. 55.823 Psycho-social Aspects of Communication Disorders.*

55.891 Thesis

A research activity that may be elected by the student in lieu of two courses (8 quarter hours), with the approval and recommendation of the adviser.

55.895 Institute in Speech Pathology and Audiology .

(see general institute description on page 108.)

55.898 Workshop in Speech Pathology and Audiology

(see general workshop description on page 108.)

55.899 Directed Study

This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the Department. *Prep. approval of the chairman of the department and of the Director of the Graduate School of Education. (Approval forms must be submitted during the quarter prior to registration for the Directed Study.)*

Teaching the Deaf

(Will not be offered 1974-75.)

55.825 Teaching Speech to Deaf Children

Utilization of vibration, visual aids, kinesthetic and proprioceptive cues, residual hearing and imitation in combination to elicit intelligible speech from the deaf.

55.826 Teaching Language and Reading to Deaf Children

Modern methods in use such as the Fitzgerald Key and the Natural Language Approach. Emphasis on how to use language in natural situations through lip reading and writing, with later emphasis on the formal presentation of language principles.

Methods used to develop reading experiences that focus on content rather than mechanics. Development of a balanced reading program that will provide adequate motivation, provision for evaluation, a wide variety of rich materials, and a well-organized sequence of reading experiences.

55.827 Methods and Materials in Deaf Education

Special methodologies in teaching the deaf. A wide view of the field and a comprehensive consideration of methods and materials. Emphasis placed on how to provide concrete experiences and activities, trips, and demonstrations to assist the child in understanding. There will also be demonstrations in the use of visual and auditory aids.

55.828 Aural Rehabilitation

Various speechreading methods, auditory training techniques, and materials. An integrated approach to the treatment of the hearing handicapped.

55.852 Practicum: Teaching of the Deaf

(8 quarter hours)

An opportunity for observing and teaching deaf children at various levels, under regular supervision in the Beverly School for the Deaf.

INSTITUTES

50.895, 51.895, 51.896, 52.895, 53.895, 50.995, 55.895

A department may offer a special institute in a specific field of interest from time-to-time. The institute may be a collaborative one offered by the several departments in the College of Education and will usually include a special institute faculty drawn from resources outside the University, as well as from the College of Education faculty. The institute will focus on a specific area of academic study and may be interdisciplinary in nature; it involves total time commitments on the part of participants in morning, afternoon, and evening sessions five or six days per week for one to eight weeks, depending upon the nature and scope of the institute. Institutes are customarily designed for participants who are currently employed in a common field of work and who are desirous of receiving additional preparation in new methods, new materials, and new content areas. Graduate credit will be granted for successful completion of an institute but may not be applied toward a degree program at Northeastern without the approval of the department in which the student is doing his major field of specialization degree work. All institute participants must be degree candidates in the Graduate School of Education or must qualify, prior to registration, as special graduate students. *Prep. permission of institute instructor.*

WORKSHOPS

50.898, 51.897, 51.898, 52.898, 53.898, 50.998, 55.898

A department may offer a special workshop in a specific field of interest from time-to-time. Emphasis in the workshop will be focused on development of instructional materials or resolution of practical problems within a single school or institutional setting, or for a group of potential workshop participants who are currently employed in a common field of work. Graduate credit will be granted for successful completion of a workshop but may not be applied toward a degree program at Northeastern without the approval of the department in which the student is doing his major field of specialization degree work. All workshop participants must be degree candidates in the Graduate School of Education or must qualify, prior to registration, as special graduate students. *Prep. permission of workshop instructor.*

DEPARTMENTAL DIRECTORY

	Office	Telephone Number
Counselor Education	405 CU	437-3276
Curriculum & Instruction	227 CU	437-3302
Director of Field Placement	90 KB	437-3280
Educational Administration	82 KB	437-3286
Foundations of Education	306 CU	437-3282
Graduate School of Education	118 CU	437-2708
Rehabilitation Administration	232 UR	437-2485
Special Education	232 UR	437-2485
Speech Pathology & Audiology	133 FR	437-2493

UNDERGRADUATE COLLEGES

Offering full-time day curricula on the Cooperative Plan leading to baccalaureate degrees

Boston-Bouvé College	College of Liberal Arts
College of Business Administration	College of Nursing
College of Criminal Justice	College of Pharmacy and Allied Health Professions
College of Education	Lincoln College
College of Engineering	

Offering part-time curricula during late afternoon and evening hours leading to associate and baccalaureate degrees

Lincoln College
University College



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northeastern university bulletin





TRANSPORTATION

(Interdisciplinary)

MISSION:

Individuals, who have an interest in Transportation Planning and have an undergraduate degree in Economics or Engineering or who have an appropriate mathematics background are encouraged to enroll in the Interdisciplinary Transportation Program. Inquiries should be addressed to: Northeastern University Graduate School of Engineering Interdisciplinary Transportation, 214 Ayden Hall, Boston, Massachusetts 02115.

MASTER OF SCIENCE IN TRANSPORTATION

Northeastern University has established a "Master Science in Transportation" degree program to deal with the special needs of individuals who are preparing themselves for careers in transportation planning. The individual's program of study will aid the individual to acquire the necessary technical skills and social science background required for a transportation planner. Courses from the Colleges of Engineering, Liberal Arts and Business Administration may be included in the student's program of study. In addition to the in class training, a student will undertake independent study project that results in a Master's Thesis. A student will work closely with a thesis advisor on some related problem. Arrangements have been made with local government agencies to involve the students with particular real world problems.

PART-TIME PROGRAM:

The program is arranged in a manner to allow a student to complete the program in one calendar year. Normally, a student will enroll in course work for three academic quarters beginning in September. The student will be eligible for graduation the following September if all course and thesis work is complete.

PART-TIME

The Part-Time Program is the same as the Full-time Program. The part-time student has a maximum of seven years to complete all degree requirements.

FINANCIAL ASSISTANCE:

Northeastern University has available financial aid for graduate study in the Master of Science in Transportation Program. Information can be obtained by contacting:

Dr. Paul J. Ossenbruggen
Program Director - Transportation
Room #101 Botolph Building
Northeastern University
Boston, Massachusetts 02115

PROGRAM OF STUDY:

Each student enrolled in the program is required to prepare a program of study which consists of required courses and electives in transportation and related fields. If a student is lacking the necessary mathematics, economics or statistics background, the student may enroll in the prerequisite courses and receive graduate credit. The program of study must consist of a minimum of forty quarter hours of credit and must be approved by the student's advisor.

<u>Required courses</u>		<u>Credits</u>
1.834 Transportation Analysis and Planning		4
1.800 Systems Analysis		4
2.847 Politics of Transportation		3
9.9L5 Economics of Urban Transportation		3
8.801 Seminar in Transportation Systems		3
3.837 Interdisciplinary Urban Transportation Seminar		2
3.820 Thesis		6

Suggested Electives

1.805 Traffic Flow Theory		4
1.806 Urban Transportation Analysis		4
1.819 Environmental Impacts of Urban Transportation		4
1.820 Transportation Engineering		2
5.904 Queuing Theory		2
5.905 Analysis with Simulation		2
5.913 Data Processing (Fortran)		2
5.914 Advanced Operations Research		4
5.818 Management Information Systems		2
1.886 Seminar in Social Research Issues		3
2.845 Problems in Municipal Administration		3
2.846 Problems in Urban and Regional Development		3
3.9K1 Regional Economics		3
3.9L1 Urban Economics I		3
3.9L2 Urban Economics II		3
3.277 Economics of Urban Environment		3
3.276 Economics of Energy Resources		3
3.9L7 Economics of Intercity Transportation		3
3.9R1 Seminar in Development Planning		3
3.818 Special Topics of Transportation		3

Pre-Requisites (Graduate credit awarded toward M.S. in Transportation Degree)

3.9D1 Mathematics for Economists or Substitute		4
3.950 Engineering Statistics I		2
3.951 Engineering Statistics II		2
3.9A0 Intermediate Microeconomic Theory		0

SPECIMEN DAY PROGRAMS

Typical Program of Study for an Individual Specializing in Transportation Systems Analysis & Planning:

	<u>FALL</u>	<u>Q.H.</u>	<u>WINTER</u>	<u>Q.H.</u>	<u>SPRING</u>	<u>Q.H.</u>
*01.800	Systems Analysis	4	*22.847 Politics of Transp.	3	*93.837 Interdis. Urb. Tran Sem.	2
*01.834	Transp. Anal.&Plan	4	*48.801 Sem. In Transp.	3	05.914 Adv. Oper. Research	4
*39.9L5	Economics of Transp.	3	01.805 Traffic Flow Theory	4	39.9R1 Development Plann.	3
01.819	Envir Impacts of Trans	4	01.806 Urban Trans Anal.	4		

Typical Program of Study for an Individual Specializing in Transportation Planning and Economics:

	<u>FALL</u>	<u>Q.H.</u>	<u>WINTER</u>	<u>Q.H.</u>	<u>SPRING</u>	<u>Q.H.</u>
*01.800	Systems Analysis	4	*22.847 Politics of Transp.	3	*93.837 Interdis. Urb. Trans. Sem.	2
*01.834	Transp. Anal. & Plann.	4	*48.801 Seminar in Transp.	3	39.9R1 Development Planning	3
*39.9L5	Economics of Transp.	3	39.9P3 Regional Devel.	3	39.9L2 Urban Economics II	3
39.9K1	Regional Economics	3	39.9L1 Urban Economics I	3		
			20.277 Econ. of Urban Dev.	2		

SUMMER

*93.820 Thesis

northeastern university bulletin



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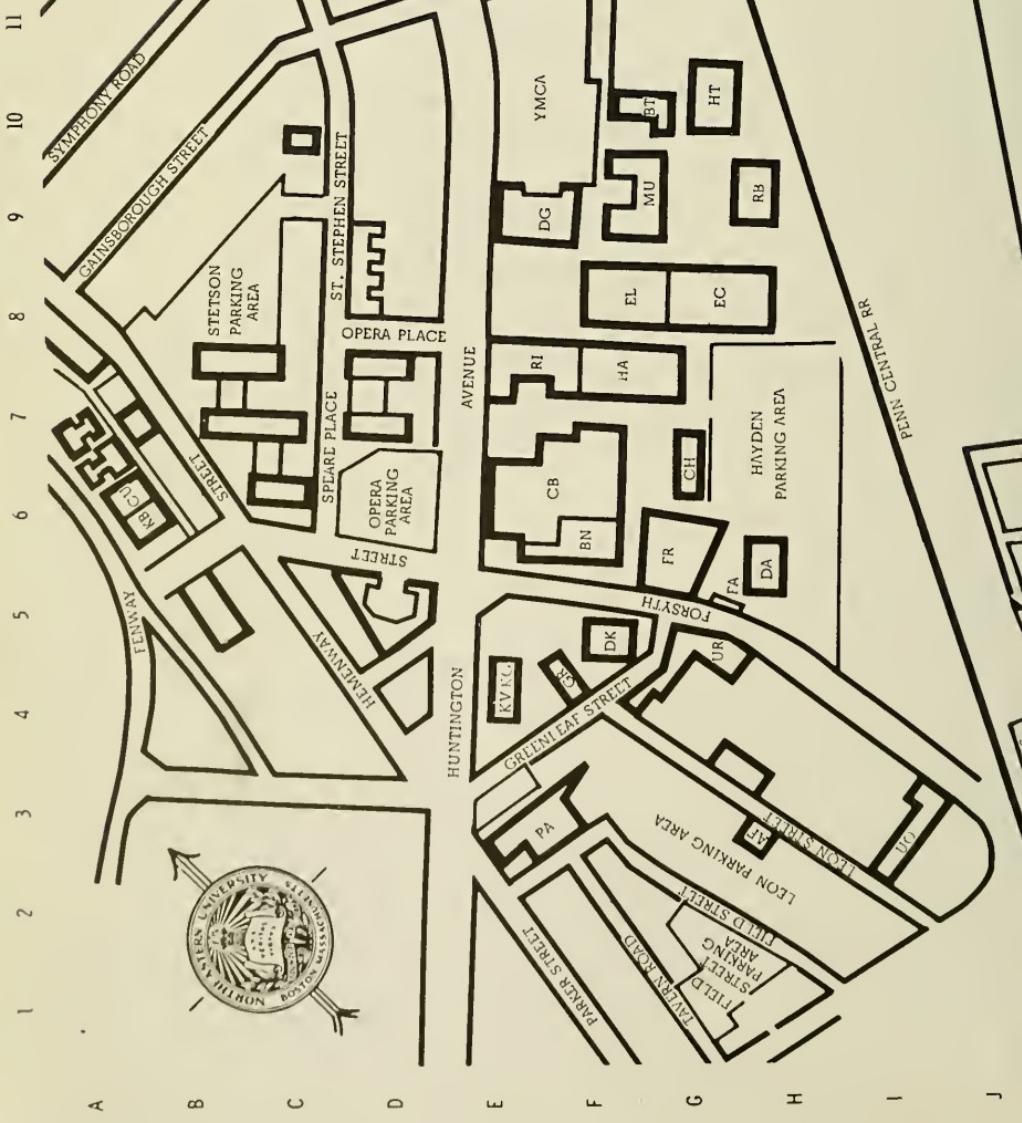
Graduate School of Engineering 1974-76



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<u>Building Designation</u>	<u>Building</u>	<u>MAP REFERENCE</u>
BN	Barletta Natatorium	F6
BT	Botolph Building	F10
CB	Cabot Physical Education Ctr.	E6
CH	Churchill Hall	G7
CU	Cushing Hall	A6
DA	Dana Research Center	H6
DK	Dockser Hall	F5
DG	Dodge Library	E9
EC	Ell Student Center and Alumni Auditorium	G8
EL	Forsyth Building	F8
FR	Forsyth Building Annex	G6
FA	Greenleaf Building	G5
GR	Hayden Hall	F4
HA	Hurtig Hall	F7
KB	Kennedy Building	G10
KV	Knowles Center (Volpe)	E6
KG	11 Leon Street	J3
UO	Afro-American Institute	H3
AF	Mugar Life Sciences Building	F9
PA	Parker Building	F3
RI	Richards Hall	E7
RB	Robinson Hall	H9
UR	United Realty Building	G5



ACADEMIC CALENDAR 1974-1975

Fall Quarter 1974

Registration period (1:00-3:00 and 5:30-8:00 p.m.)

Burlington	Tuesday-Wednesday	Sept. 17-Sept. 18
Boston	Monday-Thursday	Sept. 23-Sept. 26

Interview period for new students by

appointment*	Wednesday-Thursday	Sept. 18-Sept. 26
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Classes begin

Classes begin	Monday	September 30
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Last day to drop a course

Last day to drop a course	Saturday	November 27
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Examination period†

Examination period†	Monday-Friday	Dec. 16-Dec. 20
---------------------	---------------	-----------------

Winter Quarter 1974-1975

Registration period (1:00-3:00 and 5:30-8:00 p.m.)

Burlington	Tuesday	December 3
Boston	Monday-Thursday	Dec. 9-Dec. 12

Interview period for new students by

appointment*	Monday-Thursday	Dec. 9-Dec. 12
--------------	-----------------	----------------

Classes begin

Classes begin	Monday	January 6
---------------	--------	-----------

Last day to drop a course

Last day to drop a course	Saturday	March 8
---------------------------	----------	---------

Examination period†

Examination period†	Monday-Friday	Mar. 24-Mar. 28
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Spring Quarter 1975

Registration period (1:00-3:00 and 5:30-8:00 p.m.)

Burlington	Tuesday	March 11
Boston	Monday-Thursday	Mar. 17-Mar. 20

Classes begin

Classes begin	Monday	April 7
---------------	--------	---------

Last day to file commencement card

for spring commencement	Monday	March 31
-------------------------	--------	----------

Last day to pay fee for

spring commencement	Monday	April 28
---------------------	--------	----------

Last day to drop a course

Last day to drop a course	Saturday	June 7
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Final grades due in Registrar's

Office for June graduates taking

third quarter course	Friday	May 30
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Examination period†

Examination period†	Monday-Friday	June 16-June 20
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Spring commencement

Spring commencement	Sunday	June 22
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*Appointments for interviews with new students must be made at least four days before the date of the interview.

†Examinations for day classes will be held in accordance with the undergraduate examination schedule.

Summer Quarter 1975

Registration period (5:30-8:00 p.m.)

Burlington	Monday-Tuesday	June 16-June 17
Boston	Wednesday-Thursday	June 18-June 19
Interview period for new students by appointment	Monday-Thursday	June 16-June 19
Classes begin	Monday	June 30
Last day to file a commencement card for fall commencement	Tuesday	July 1
Examination period	Wednesday-Friday	Aug. 6-8
Last day to pay fee for fall commencement	Wednesday	July 30

UNIVERSITY HOLIDAYS 1974-1975

Columbus Day	Monday	October 14
Veterans' Day	Monday	October 28
Thanksgiving Recess	Thursday-Saturday	Nov. 28-Nov. 30
Christmas Vacation	Monday-Saturday	Dec. 23-Jan. 4
Washington's Birthday	Monday	February 17
Patriots' Day	Monday	April 21
Memorial Day	Monday	May 26
Independence Day	Friday	July 4
Labor Day	Monday	September 1

Equal Opportunity Policy

Northeastern University is committed to a policy of providing equal opportunity for all. In all matters involving admission, registration, and all official relationships with students, including evaluation of academic performance, the University insists on a policy of nondiscrimination. Northeastern University is also an equal opportunity employer; it is institutional policy that there shall not be any discrimination against any employee or applicant for employment because of race, color, religion, sex, age or national origin. In addition, Northeastern takes affirmative action in the recruitment of students and employees.

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Melvin Mark, Dean of Engineering
Frank E. Marsh, Jr., Dean of Education
Edmund J. Mullen, Assistant Dean of University Administration and Associate University Registrar
John C. O'Byrne, Dean of the School of Law
Barbara Philbrick, Assistant Professor of Physical Education and Coordinator of Programs for Boston-Bouvé College Graduate School
Marianne Radziewicz, Registrar of the School of Law

Norman Rosenblatt, *Dean of Criminal Justice and Director
of the Graduate Program in Criminal Justice*

Philip J. Rusche, *Director of the Graduate School of Education*

Robert A. Shepard, *Dean of Liberal Arts*

Albert Soloway, *Director of the Graduate School of Pharmacy and Allied
Health Professions*

Ex Officio

Arthur E. Fitzgerald, *Dean of Faculty*

Rudolph M. Morris, *Dean of University Administration*

Loring M. Thompson, *Dean of Planning*

Committee on Graduate Study in Engineering

1974-1976

George W. Hankinson, *Chairman, Assistant Dean of Engineering and
Director of the Graduate School of
Engineering and Professor of
Civil Engineering*

Arthur R. Foster, *Professor of Mechanical Engineering
and Chairman of the Department*

Bernard M. Goodwin, *Associate Professor of Chemical Engineering*

Thomas J. Kerr, *Assistant Director of the
Graduate School of Engineering*

Melvin Mark, *Dean of Engineering*

David R. Freeman, *Professor of Industrial Engineering and
Chairman of the Department*

Harold R. Raemer, *Professor of Electrical Engineering
and Chairman of the Department*

Ernest L. Spencer, *Professor of Civil Engineering
and Chairman of the Department*

Alvah K. Borman, *Ex Officio, Dean of Graduate Placement Services*

the university

Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under the General Laws of Massachusetts. The State Legislature by special enactment has given the University general degree-granting powers. The University is governed by a Board of Trustees elected by and from the Northeastern University Corporation, which is composed of nearly 180 distinguished business and professional men and women.

From its beginning, Northeastern University has had as its dominant purpose the discovery of community educational needs and the meeting of these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Cooperative Plan, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922), Liberal Arts (1935), Education (1953), Pharmacy (1962), Nursing (1964); Boston-Bouvé College (1964); the College of Criminal Justice (1967); and by Lincoln College's daytime Bachelor of Engineering Technology program (1971). This educational method enables students to gain valuable practical experience as an integral part of their college program and also provides the means by which they may contribute substantially to the financing of their education. The Plan has been extended to the graduate level in engineering, actuarial science, rehabilitation administration, professional accounting, business administration, and law.

In the field of adult education, programs of study have been developed to meet a variety of needs. University College offers evening courses — offered by the University since 1906 — and adult-day courses leading to the bachelor's degree. In addition to offering day undergraduate programs in Electrical Engineering Technology and Mechanical Engineering Technology, Lincoln College offers evening/part-time certificate, associate, and bachelor degree programs in technological areas. All formal courses of study leading to degrees through part-time programs are approved by the Basic College faculties concerned.

GRADUATE AND PROFESSIONAL SCHOOLS

The ten graduate and professional schools of the University offer day and evening programs leading to the degrees listed.

The Graduate School of Actuarial Science offers the degree of Master of Science in Actuarial Science.

The Graduate School of Arts and Sciences offers the degrees of Master of Arts, Master of Science, Master of Science in Health Science, Master of Public Administration, and Doctor of Philosophy.

The Graduate School of Boston-Bouvé College offers the degree of Master of Science.

The Graduate School of Business Administration offers the degree of Master of Business Administration.

The Graduate Program in Criminal Justice offers the degree of Master of Science.

The Graduate School of Education offers the degree of Master of Education and the Certificate of Advanced Graduate Study.

The Graduate School of Engineering offers the degrees of Master of Science, Engineer degree, Doctor of Engineering, and Doctor of Philosophy.

The School of Law offers the degree of Juris Doctor.

The Graduate School of Pharmacy and Allied Health Professions offers the degrees of Master of Science and Doctor of Philosophy.

The Graduate School of Professional Accounting offers the degree of Master of Science in Accounting.

CENTER FOR CONTINUING EDUCATION

The Center for Continuing Education was established in 1960 to relate the University to the needs of its community in a period of accelerated change. Adult education programs offered by the Center and University College have since been consolidated. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. The Division of Special Programs, working cooperatively with trade associations and professional societies, offers a wide variety of programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

RESEARCH ACTIVITIES

The facilities of the University are engaged in a wide variety of basic research projects in business, science, social science, pharmacy, and engineering. These are coordinated by the Dean of Research, whose services are University-wide and available to the faculties of all the Colleges.

Although Northeastern is primarily concerned with undergraduate and graduate instruction, the University believes that the most effective teaching and learning takes place in an environment characterized by research activities directed toward extending the frontiers of knowledge.

buildings and facilities

MAIN CAMPUS

The main campus of Northeastern University is located at 360 Huntington Avenue in the Back Bay section of Boston. Many of the city's famous cultural, educational, and philanthropic institutions are situated in the Back Bay, including the Museum of Fine Arts, Symphony Hall, Horticultural Hall, the Isabella Stewart Gardner Museum, the Harvard teaching hospitals, the Boston Public Library, and many schools and colleges. Most are within walking distance of Northeastern University.

Major transportation facilities serving the Boston area are Logan International Airport, two rail terminals, bus terminals serving inter- and intrastate lines, and MBTA subway-bus service within the metropolitan-suburban area. There is a subway stop in front of the campus. For motorists, the best routes to the campus are the Massachusetts Turnpike (Exit 22) and Route 9, of which Huntington Avenue is the intown section.

The campus of 48 acres is divided by Huntington Avenue, with the main educational buildings on one side and dormitories on the other. The principal buildings, all of which have been constructed since 1938, are of glazed brick in contemporary classic style. Most are interconnected by underground passageways.

EII Student Center

The Carl S. EII Student Center provides facilities for student recreation and for extracurricular activities. The Alumni Auditorium, with a seating capacity of 1,300, is part of the Center. Also included are special drama facilities, a ballroom, main lounge, fine arts exhibition area, student offices, conference rooms, and a dining area seating more than 1,000.

Libraries

The University library system consists of the Dodge Library, which is the main library; the Suburban Campus Library at Burlington; the School of Law Library; and divisional libraries for Physics and Electrical Engineering, Chemistry and Biology, Mathematics and Psychology, Health, Physical and Recreation Education, and Physical Therapy. There are additional subject collections for the Center for Management Development at Andover, Massachusetts, and the Marine Science Institute in Nahant.

The library collections number 360,000 volumes supplemented by some 267,000 titles in microprint, microfilm, and microfiche forms. The collection includes, in addition, some 3,500 periodical titles, 90,000 documents, and 4,600 sound recordings.

Cabot Physical Education Center

The Godfrey Lowell Cabot Physical Education Center is one of the best equipped in New England. It contains four basketball courts, an athletic cage, a women's gymnasium, and a rifle range, as well as administrative offices for the Department of Athletics and for the Physical Education Department of Boston-Bouvé College.

A recent addition to the center, the Barletta Natatorium, houses a 105-foot swimming pool, a practice tank for the crew, handball courts, and shower and dressing facilities.

Dockser Hall

Charles and Estelle Dockser Hall, completed in 1968, houses a large gymnasium, dance studio, motor performance laboratory, college library, community recreation laboratory, folk arts center, dark and music rooms, recreation resources area, locker rooms, offices, classrooms, conference room and lounge, storage facilities, and a research laboratory.

Apartments for Upperclass Students

The University maintains a 100-apartment housing unit which accommodates 279 people. Two-, three-, and four-party apartments are available which vary in size from two to four rooms plus bath. Apartments are furnished with beds, chairs, desks, stove, refrigerator, and kitchen table. The cost includes all utilities.

A \$50 deposit is required when making application for the apartments. Applications are available in the Office of University Housing. Students are expected to make such arrangements on a term-to-term basis but may live in the apartments both while on cooperative work assignments and in school if they wish. All reservations are made on a first-come, first-served basis.

SUBURBAN FACILITIES

Suburban Campus

The Suburban Campus, located near the junction of Routes 128 and 3 in Burlington, Massachusetts, was established to meet the needs of individuals and of industry in the area.

In addition to graduate courses in engineering, physics, mathematics, business administration, science, education, and the arts, portions of undergraduate programs leading to the associate and bachelor's degrees, special programs for adults, and noncredit state-of-the-art programs are offered.

Warren Center

The Warren Center is a practical laboratory for Boston-Bouvé College in outdoor education and conservation, in group practicum, and in camping administration, programming, and counseling. At this Center in Ashland, completed in 1967, there are tennis courts, field hockey and lacrosse fields, waterfront for swimming and boating, overnight camp sites, fields and forests, heated cottages, the Hayden Lodge with a recreation hall, library, crafts shop, dining facilities, and conference accommodations.

Henderson House

The University's conference center, Henderson House, is located in Weston, Massachusetts. The Center for Continuing Education conducts short-term courses, seminars, and special institutes for business, professional, and research groups. Henderson House is 12 miles from the main campus.

Marine Science Institute

The Marine Science Institute at Nahant, Massachusetts, is a research and instructional facility primarily engaged in studies of marine biology and oceanography. The Institute is operated all year, and is about 20 miles northeast of Boston. Many of the courses at this institute are applicable toward an advanced degree in biology or health science.

Government Center Campus

With the cooperation of the Federal Executive Board, the Graduate School of Liberal Arts' Department of Political Science offers an entire Master of Public Administration program at the John F. Kennedy Building in downtown Boston. This program is primarily for individuals employed in Federal, state, or local civil services.

Brockton, Nashua, and Framingham Campuses

For students residing in southeastern Massachusetts and northeastern Rhode Island, the Graduate School of Business Administration offers a significant portion of its M.B.A. Program at facilities in Brockton, Massachusetts. These facilities, made available by the Knapp Corporation, are located on West Chestnut Street in Brockton.

Students residing in the southern New Hampshire area may take a significant portion of the M.B.A. Program at facilities in Nashua, New Hampshire. These facilities are furnished by Sanders Associates, Inc. and are located in their headquarters on Route 3, just over the Massachusetts line.

For students in the Framingham-Worcester area, a significant portion of the M.B.A. Program may be taken at classroom facilities located in Framingham, Massachusetts.



regulations of the graduate school of engineering

The Master of Science degree may be earned in Chemical Engineering, Civil Engineering, Electrical Engineering, Industrial Engineering, Mechanical Engineering, and Engineering Management. In addition, there are programs leading to the Doctor of Philosophy degree in Chemical Engineering, Civil Engineering, Electrical Engineering, and Mechanical Engineering. The Doctor of Engineering degree is offered in Chemical Engineering. The Engineer degree may be earned in Electrical Engineering and Mechanical Engineering.

Cooperative Programs

A unique feature of Northeastern's Graduate School of Engineering is the full-time Cooperative Education Plan. This program adopts the philosophy that a balanced exposure to theory and practice will provide students with a more meaningful education.

All engineering graduate departments offer full-time programs on the Cooperative Plan. The program includes nine months of classroom study and twelve months of work experience in an industrial concern. The cooperative student is able to gain vital experience in a professional environment while also supplementing his tuition payments.

The University has a full-time experienced staff to assist the student in obtaining a cooperative work assignment. The student may also wish to investigate employment opportunities on his own in order to facilitate final placement by the graduate coordinator.

An illustration of term sequence within the two-year Cooperative Education Plan is shown below:

	First Year	Second Year
Fall Quarter	class	work
Winter Quarter	work	class
Spring Quarter	class	work
Summer Quarter	work	

Normally, the Cooperative Plan operates as shown above. Economic conditions, the military, citizenship, and other factors may cause a departure from the normal Plan. Students who are admitted to a masters degree program under the Cooperative Plan must complete, through satisfactory performance, each cooperative work assignment in order to be eligible for their degree.

Engineering Sponsorships (Beginning Academic Year 1975)

Another aspect of Cooperative Education is the Engineering Sponsorship Program. This program provides students with exposure to academic theory and industrial experience. The sponsoring Company, by employing the students during cooperative work quarters, provides a monthly salary for the two (2) year period plus a tuition stipend.

All students who are accepted as full-time cooperative students are considered for Engineering Sponsorships. Notification will be received prior to April 15th if a student has been chosen for a sponsorship. Those students not chosen are still eligible for placement under the Cooperative Plan of Education.

GENERAL REGULATIONS

The general regulations and minimum requirements for all graduate programs are established by the University Graduate Council. In some matters the committee of each graduate school is allowed discretion to establish regulations within limits defined by the council. The regulations and academic requirements which follow have been formulated in accordance with this general policy.

Application Procedures

All applicants for cooperative full-time or continuous full-time study at the master's level should address inquiries to their respective departments or to the Graduate School of Engineering. Application forms and reference blanks will be mailed to the applicant. This material, together with the \$15.00 non-refundable application fee, necessary transcripts, two letters of recommendation, the Graduate Record Examination scores when required, and the results of the Test of English as a Foreign Language (required of all applicants whose native language is not English), should be returned to the Graduate School of Engineering Office as soon after January 15th as possible. The Admissions Committee will notify applicants as soon as their material is complete.

All applicants for part-time study at the master's level should request an application from the Graduate School of Engineering Office. The completed application, the non-refundable \$15.00 application fee and an official transcript should be sent to the graduate school no later than two weeks prior to the interview and registration period for the quarter

in which the applicant plans to begin his program. The dates of the interview and registration periods are announced in the catalog (see academic calendar) and in the circular issued each July. Applicants will be notified by mail regarding acceptance. Mailed applications will be accepted up to two weeks prior to the registration period for the quarter in which the applicant plans to begin the program.

If an applicant is unable to submit the application material by mail at least two weeks prior to the registration period, he should call the Graduate School Office to arrange for a personal interview to determine his qualifications for admission. The application, the non-refundable \$15.00 application fee and the official transcript may be submitted at the interview.

In some cases, the Graduate Record Examination may be required of applicants. The examination is administered by the Educational Testing Service, Box 955, Princeton, New Jersey, 08540. Applicants must make their own arrangements with the Educational Testing Service for the examination.

Test scores for Graduate Record Examinations and Test of English as a Foreign Language sent to the Graduate School of Engineering are retained for only one year from the date they were taken. If an applicant does not enroll in the quarter for which he was accepted, but delays his registration for a period of one year or more from the date that he originally took his examinations, he must repeat the examinations or resubmit the original test scores before he will be permitted to register.

Transcripts

Official transcripts of previous college training must be supplied with the mailed application if an admissions decision is to be rendered by return mail, or submitted at the personal interview. If this is not feasible, the official transcripts must be mailed to the Graduate School of Engineering as soon after the initial registration as possible. Students who have attended institutions outside of the United States should provide comparable certified documents. Failure to file the necessary transcripts will result in the student being asked to withdraw.

Admission

To be admitted for graduate work, an applicant must have obtained a Bachelor of Science degree in engineering or a closely related science from a recognized college or university with an acceptable quality of undergraduate work. His scholastic record, therefore, must show ability to pursue creditably a program of graduate study, and his undergraduate training must indicate breadth as well as adequate preparation in the field in which the applicant expects to do advanced work. Acceptance to the school is granted upon recommendation of the departmental graduate committee or its designate following a review of the applica-

tion and supporting material. The recommendation is based upon promise of academic success and fulfillment of minimum criteria established by each department in the Graduate School of Engineering.

Students with an engineering or related science bachelor's degree, who are enrolled in another graduate school at Northeastern, may transfer to the Graduate School of Engineering. However, they must make application and file the necessary documents, the same as transfers from other colleges or universities. The submission of registration materials for engineering course work does not constitute enrollment in the Graduate School of Engineering.

Registration

Students must register within the dates and times listed on the school calendar. The place of registration will be announced prior to each period.

Auditors are not permitted. All students attending any course in the Graduate School of Engineering must be officially registered by the Registrar and listed on the class roster.

Residence

All work for advanced degrees must be completed at the University unless approval has been obtained from the director of the graduate school for work taken elsewhere. Students who are in residence and are using the facilities of the University must register for such work.

Programs of Study

The curricula of the degree programs are given under each departmental heading. The descriptions of courses offered by the several departments are given so that prospective students may obtain a view of the course coverage. Preparation courses are indicated when necessary. Not all courses are offered every year, but the course offerings will be arranged in such a manner that students may make continuous progress toward the degree.

The Graduate School of Engineering issues a circular close to July 1st which gives the courses for the following academic year and the times at which they meet.

The number of students enrolled in each class will be limited to permit effective teaching at the graduate level. The University reserves the right to cancel, postpone, combine, or modify any course.

At the time of his first registration, each full-time student must develop, with the assistance of his faculty adviser, a complete program of study for the degree for which he is registered. All subsequent changes must be approved by his faculty adviser.

Part-time students will be expected to complete the required courses outlined by each department, after which the elective courses may be

undertaken. The study load for such students is limited to a program of two courses per quarter (one course in the summer) unless special permission to carry a heavier load is given by the director of the graduate school.

Grading System

The performance of students in graduate courses will be recorded by the instructor by use of the following grades:

A Excellent

This grade is given to those students whose performance in the course has been of very high graduate caliber.

B Satisfactory

This grade is given to those students whose performance in the course has been at a satisfactory level.

C Fair

This grade is given to those students whose performance in the course is not at the level expected in graduate work.

F Failure

This grade is given to those students whose performance in the course is unsatisfactory.

In addition, the following letter designations are used:

I Incomplete

This grade is given to those students who fail to complete the work of the course.

S Satisfactory without quality designation.

U Unsatisfactory without quality designation.

These grades are used for the first quarter of a two-quarter sequence in which the grade for the second quarter applies to both the first and second quarters of the sequence. The designations S and U may also be used for thesis and seminar work.

The I grade will be changed to a letter grade upon removal of the deficiency which caused the grade of I to be reported. Deficiencies must be made up within the quarter following that for which the grade of I is received unless an extension of time is granted by the instructor. However, such extension of time may not exceed two additional consecutive calendar quarters.

Any student who wishes to make-up a final examination must obtain permission from the director of the graduate school by the second week of the quarter succeeding that in which the examination was missed. The make-up examination must be taken in that succeeding quarter unless circumstances warrant permission of the director to defer it to one of the next two quarters.

Class Hours and Credits

All credits are entered as quarter hours. A quarter hour of credit is equivalent to three fourths of a semester hour credit. All classes meet on a quarter basis. In the summer session, classes meet for six-week periods. The academic calendar in the front of this catalog should be consulted for the opening and closing dates of each academic quarter.

Continuity of Program

Students are expected to maintain continuous progress toward the degree. Any student who has not attended the Graduate School of Engineering for a period of one year must apply to the director for re-admission.

Withdrawals

In order to withdraw from a course, a student must fill out an official withdrawal form obtained at the Registrar's Office or at the Suburban Campus Office. Withdrawals may be made through the ninth class meeting of the quarter. Students will be withdrawn as of the date on which they fill out the official withdrawal form. Ceasing to attend a class or notifying the instructor does not constitute an official withdrawal.

Requests for withdrawal from a course after the ninth class meeting of the quarter may be submitted to the Director of the Graduate School, and may be approved to avert unusual hardships on a student.

Changes in Requirements

The continuing development of the graduate school forces frequent revision of curricula. In every new bulletin some improvements are indicated. When no hardship is imposed on the student because of changes, and when the facilities of the school permit, the student is expected to meet the requirements of the latest bulletin. If the student finds it impossible to meet these requirements, the bulletin for the year in which he entered becomes the binding one.

Filing for the Degree

Each student who plans to graduate either in June or September must submit to the Registrar's Office a completed commencement data card prior to the deadline listed in the academic calendar for that commencement at which he expects to receive the degree. If the deadline for filing is not met there is no assurance that the degree will be awarded that year. The commencement data card is supplied with the registration materials or is available in the Registrar's Office.

THE MASTER'S DEGREE

Admission

Specific requirements for each degree program will be found in the appropriate paragraphs for each academic department in the Graduate School of Engineering. General Requirements are listed under *Application Procedures*.

Academic Classifications

Students initially entering the Graduate School are classified into one of three groups according to their admission qualifications.

Regular students are those who meet in full all admittance criteria based on the standards established by the Committee on Graduate Study in Engineering.

Provisional students are those whose records are above the minimum required for acceptance but do not qualify them for regular admission based on the standards established. Therefore, provisional students must obtain a B average in their first 12 quarter hours of course work to continue in the graduate school and be reclassified as regular.

Special students are those who do not wish to pursue a master's degree program or who may already possess the master's degree. Special students with only the bachelor's degree must meet the same admission criteria as the regular or provisional student and will be limited to a maximum of 12 quarter hours of graduate credits.

Any student whose record is not satisfactory may be dropped from the program regardless of his classification.

Academic Requirements

A candidate for the master's degree must satisfactorily complete an approved program consisting of a minimum of 40 quarter hours of correlated work of graduate caliber and such other study as may be required by the department in which he is registered.

To qualify for the Master of Science degree from the Graduate School of Engineering each student must have an average grade accumulative of not less than B with no more than 12 credits below a B in all courses undertaken at Northeastern University. The Committee on Graduate Study in Engineering allows eight quarter hours of credit to be taken in addition to the stated degree requirements to repeat failed required courses or to substitute for elective courses to obtain the required B average for completion of degree requirements. The number of I grades that a student may accrue will be limited.

Within the above limitations for extra or repeated courses, a required course for which a grade of F is received must be repeated with a grade of C or better, and may be repeated only once. If a grade of F is

received in an elective course, that course may be repeated once to obtain a grade of C or better, or another elective course may be substituted for it. If a grade of C is received in a required course, that course may be repeated once to obtain a grade of B or better.

Comprehensive Examination

At the discretion of the department, a final written or oral comprehensive examination may be required. Such examinations will be given at least two weeks before the commencement at which the degree is expected.

Thesis

If a thesis is required in partial fulfillment of degree requirements, it must show independent work based in part upon original material, and must meet the approval of the departmental graduate committee.

The thesis must receive a grade of B or better to be accepted. Instructions for the preparation of the thesis may be obtained from the department.

Transfer Credits

A maximum of 12 quarter hours of credit obtained at another institution may be accepted toward the master's degree provided that the credits transferred are in the candidate's field, consist of work taken at the graduate level for graduate credit, carry grades of A or B, have been earned at a recognized college or university, and have not been used toward any other degree. Students should petition the Graduate School of Engineering in writing for all transfer credits. Grades on transfer credits may not be used for the purpose of obtaining the academic average necessary for completion of the degree requirements.

Time Limitations

Course credits earned in the program of graduate study, or accepted by transfer, are valid for a maximum of seven years unless an extension is granted by the graduate school committee.

Fellowships

The departments of the Graduate School of Engineering have two types of fellowships available. Some departments have teaching assistantships and research fellowships for students enrolled in work leading to the master's degree. The departments which give doctoral degrees also have research fellowships for such students.

Assistantships

Some departments have teaching assistantships, on the Cooperative Plan, in which students alternate full-time academic work with full-time

work in the department. Some departments also have available research fellowships. Applications for traineeships must be filed by March 15, with two letters of recommendation and a transcript of all prior college work. All students must have their course program approved by the chairman of the respective department before the student registers.

Cooperative Programs

All the departments offer the Cooperative Education Plan. The Plan consists of nine months of classroom study and twelve months of work experience in an industrial concern.

Full-Time Program

All the departments offer a continuous full-time program in which the requirements for the master's degree can be completed in one academic year.

Part-Time Program

Most of the departments offer part-time programs in which the admission requirements are the same as for full-time programs. However, the program is established in such a way that students may progress according to their abilities and the time available. The curricula of the part-time programs are specified by the departments.

An official transcript of prior college work must be submitted with an application by those who apply by mail, or at the personal interview for those who apply after the deadline for mailing. Mail applications will be accepted up to two weeks prior to the registration period for the quarter in which the applicant plans to enter the Graduate School.

Honorary Societies

Northeastern University has chapters of Tau Beta Pi, Sigma Xi, and Phi Kappa Phi. Graduate students are eligible for consideration for election to these societies in accordance with the admission requirements of each organization.

THE DOCTOR OF PHILOSOPHY DEGREE

The Doctor of Philosophy degree is awarded to candidates who give evidence of high attainment and research ability in their major field. The degree requirements are administered by committees in charge of each degree program. These committees may be departmental graduate committees or the committee of the graduate school, depending upon the nature of the program. It is the responsibility of the chairman of the committee to certify to the Graduate School of Engineering the completion of each requirement for each candidate.

Admission

Each degree program has an established admission procedure for students starting their doctoral work at Northeastern University. Initial contact should be with the chairman of the appropriate department.

Classification and Degree Candidacy

Students taking advanced graduate work are classified as follows:

1. Doctoral Student

Students in this classification have been admitted to a doctoral program.

2. Doctoral Degree Candidate

Students in this classification are doctoral students who have completed 40 quarter hours of acceptable graduate work beyond the bachelor's degree and have passed the qualifying examination.

3. Special Students

This classification is given to students taking advanced graduate work who are not enrolled for a master's degree, and who have not been admitted to a doctoral program.

Residence Requirement

Candidates for the Doctor of Philosophy degree must spend the equivalent of at least one academic year in residence at the University taking graduate work. The committee of each degree program specifies the method by which the residence requirement is satisfied.

Qualifying Examination

Students must pass a qualifying examination within time limits set by the committee of the degree program. The material covered in the qualifying examination and the level of course work necessary to prepare for the examination are established by the committee for each program.

Comprehensive Examination

Degree programs may require a comprehensive examination during the time in which a student is a degree candidate. The purpose of this examination is to test the knowledge and skills of the student in a particular area and his knowledge of recent research developments in his field.

Course Requirements

The minimum course requirements of 40 quarter hours constitute the work normally required for a master's degree. The course require-

ments beyond this are the doctoral course requirements and the amount of such work necessary in each doctoral program is specified by the committee in charge of the doctoral program.

Dissertation

Each doctoral student must complete a dissertation which embodies the results of extended research and makes an original contribution to the field. This work should give evidence of the candidate's ability to carry out independent investigation and interpret in a logical manner the results of the research. The method of approval of the dissertation is established by the committee in charge of the degree program. The original bound copy of the dissertation must be deposited in the library.

Language Requirement

The foreign language requirement and how it is satisfied is established by the committee in charge of each degree program.

Final Oral Examination

The final oral examination will be taken after completion of all other requirements for the degree. This examination must be held at least two weeks before the commencement at which the degree is to be awarded.

The committee for the final oral examination for the doctoral degree is appointed by the committee in charge of the degree program, and the director of the graduate school is notified of the time of the examination.

The final oral examination will be on the subject matter of the doctoral dissertation and significant developments in the field of the dissertation. Other fields may be included if recommended by the examining committee.

Transfer Credit

If transfer credit for doctoral course work is desired, approval for such transfer credit must be given by the committee in charge of the degree program.

Time Limitation

After the establishment of degree candidacy, a maximum of five years will be allowed for the completion of the degree requirements. If a student wishes to obtain a time extension, he may, with the approval of the committee of his degree program, petition the Committee on Doctoral Degree Programs of the University Graduate Council for such extension.

Registration

All students must register for course work or dissertation as approved by their advisers or the departmental registration officer. After the first registration for doctoral work, registration must be continuous unless withdrawal is allowed by the committee in charge of the degree program. Students must be registered for dissertation during the quarter in which they take the final oral examination.

THE DOCTOR OF ENGINEERING DEGREE

The Doctor of Engineering degree is awarded to candidates who give evidence of high attainment and ability in their major field. The degree requirements are administered by committees in charge of each degree program. These committees may be departmental graduate committees or the committee of the graduate school depending upon the nature of the program. It is the responsibility of the chairman of the committee to certify to the Graduate School of Engineering the completion of each requirement for each candidate.

Admission

Each degree program has an established admission procedure for students starting their doctoral work at Northeastern University. Initial contact should be with the chairman of the appropriate department.

Classification and Degree Candidacy

Students taking advanced graduate work are classified as follows:

1. Doctoral Student

Students in this classification have been admitted to the doctoral program.

2. Doctoral Degree Candidate

Students in this classification are doctoral students who have completed 40 quarter hours of acceptable graduate work beyond the bachelor's degree and have passed the qualifying examination.

3. Special Students

This classification is given to students taking advanced graduate work who are not enrolled for a master's degree, and who have not been admitted to a doctoral program.

Residence Requirement

Candidates for the Doctor of Engineering degree must spend the equivalent of at least one academic year in residence at the University

taking graduate work. The committee of each degree program specifies the method by which the residence requirement is satisfied.

Qualifying Examination

Students must pass a qualifying examination within time limits set by the committee of the degree program. The material covered in the qualifying examination and the level of course work necessary to prepare for the examination are established by the committee for each program.

Comprehensive Examination

Degree programs may require a comprehensive examination during the time in which a student is a degree candidate. The purpose of this examination is to test the knowledge and skills of the student in a particular area and his knowledge of recent research developments in this field.

Course Requirements

The minimum course requirements of 40 quarter hours constitute the work normally required for a master's degree. The course requirements beyond this are doctoral course requirements, and the amount of such work necessary in each doctoral program is specified by the committee in charge of the doctoral program.

Dissertation

The dissertation for the Doctor of Engineering degree is fundamentally different from that of the Doctor of Philosophy degree. In general, the latter focuses on contributions to new knowledge in the engineering sciences and is expected to demonstrate the student's competence as a researcher. The dissertation for the Doctor of Engineering degree focuses on creative engineering design and in-depth engineering studies. It may, and usually will, contain elements that involve research, but above all, it must demonstrate the student's ability to work creatively on engineering analysis and design problems such as those encountered in professional practice.

Language Requirement

There is no foreign language requirement, but, in lieu of such a requirement, the student must demonstrate proficiency in computer software techniques and an acceptable machine language.

Final Oral Examination

The final oral examination will be taken after completion of all other requirements for the degree. This examination must be held at least two

weeks before the commencement at which the degree is to be awarded.

The committee for the final oral examination for the doctoral degree is appointed by the committee in charge of the degree program, and the director of the graduate school is notified of the time of the examination.

The final oral examination will be on the subject matter of the doctoral dissertation and significant developments in the field of the dissertation. Other fields may be included if recommended by the examining committee.

Transfer Credit

If transfer credit for doctoral course work is desired, approval for such transfer credit must be given by the committee in charge of the degree program.

Time Limitation

After the establishment of degree candidacy, a maximum of five years will be allowed for the completion of the degree requirements. If a student wishes to obtain a time extension, he may, with the approval of the committee of his degree program, petition the Committee on Doctoral Degree Programs or the University Graduate Council for such extension.

Registration

All students must register for course work or dissertation as approved by their advisers or the departmental registration officer. After the first registration for doctoral work, registration must be continuous unless withdrawal is allowed by the committee in charge of the degree program. Students must be registered for dissertation during the quarter in which they take the final oral examination.

Professional Experience

The student is required to present evidence of at least one calendar year of experience in engineering practice at a suitable professional level. This experience must have been acquired after completion of a bachelor's degree in a branch of engineering. The committee in charge of each degree program specifies the details of the professional experience requirement.

INTERDISCIPLINARY PROGRAMS

Some graduate students may wish to pursue doctoral programs which involve substantial work in two or more departments. To meet this need,

an interdisciplinary program may be established which corresponds in scope and depth to doctoral standards, but does not agree exactly with the individual departmental regulations. For such possibilities, the following plan is in operation:

Admission

Application for admission to interdisciplinary doctoral study consists of the submission of a carefully thought-out written proposal describing the areas of proposed study and research. The proposal may be a part of the initial application for admission to graduate study at Northeastern University, or it may be submitted by a student already enrolled. It may be directed to a doctoral degree-granting department or to the director of the graduate school, who directs it to the appropriate department. In either case, admission to interdisciplinary doctoral study requires favorable recommendation by the sponsoring doctoral degree-granting department and approval by authorized representatives of the graduate study committees of the departments appropriate to the disciplines covered by the applicant's proposal. The sponsoring department becomes the registration base of the student.

Formation of Interdisciplinary Committee

A student who has been accepted for interdisciplinary study must obtain the consent of an adviser who will direct his doctoral thesis. This adviser, who may or may not be a member of the registration department, will be chairman of the interdisciplinary committee for this student. A second member will be appointed from the registration department by its chairman. These two members will obtain one or more additional members or request the director of the graduate school to do so. At least two departments must be represented on the committee and a majority of the committee must come from doctoral degree-granting departments. The chairman of the registration department will notify the director of the graduate school of the membership of the committee as soon as arrangements are complete.

Duties of Interdisciplinary Committee

A member of the interdisciplinary committee who is also a member of the registration department will serve as the registration officer to approve the course registration for the student. A copy of the approved course registration must also be filed with the other committee members and with the graduate study committee of the registration department.

The interdisciplinary committee will be responsible for the administration of the qualifying examination, language examination, approval of the dissertation, and comprehensive examination. This committee must

also certify to the registration department the completion of the requirements for the award of the doctoral degree.

The interdisciplinary committee must assure that the program of the student represents standards comparable to those of the registration department and that the program is not so broad that it has inadequate depth in any area.

The program of the student may be reviewed at any time by the director of the graduate school to determine whether objectives of the program are being met.

THE ENGINEER DEGREE

The degree of Engineer is intended for those who do not wish to make a commitment to post-master's degree graduate study that is as extensive as that required for one of the doctor's degrees. It is an intermediate degree, between master's and doctor's degrees. A student who has completed the Engineer degree is eligible to apply for admission to a doctor's degree program.

Admission

Each departmental Engineer degree program has its own admission procedure for students beginning the program. Normally a master's degree in engineering or related field is required. Initial contact should be with the chairman of the appropriate department.

Classification and Degree Candidacy

A student admitted to the Engineer degree program will be designated as a candidate for this degree.

Residence Requirement

Candidates for the Engineer degree must spend the equivalent of at least two academic quarters in residence at the University taking graduate work. The committee of each degree program specifies the method by which the residence requirement is satisfied.

Qualifying and Comprehensive Examinations

The committee for each Engineer degree program specifies its own examinations. Normally, no qualifying examination is required for candidacy and no comprehensive examination is required for completion, but individual departments offering the degree may require such examinations.

Course Requirements

The minimum course requirement will be 40 quarter hours beyond the master's degree, with no more than 10 quarter hours of credit out of the 40 allowed for work on the dissertation. A minimum of 20 quarter hours must be taken in the department in which the degree is offered. Specific course requirements for each Engineer degree program are determined by the departmental committee in charge of the program.

Dissertation

Each Engineer degree student must complete a dissertation which demonstrates a high level of competence in engineering research, development, or design. As a general guideline, the amount of effort normally expected will be the equivalent of about 10 quarter hours of graduate course work.

Language Requirement

No foreign language is required for the Engineer degree.

Final Oral Examination

A final oral examination may be required by the departmental committee in charge of the Engineer degree program. The examination will normally consist of a defense of the dissertation.

Transfer of Credit

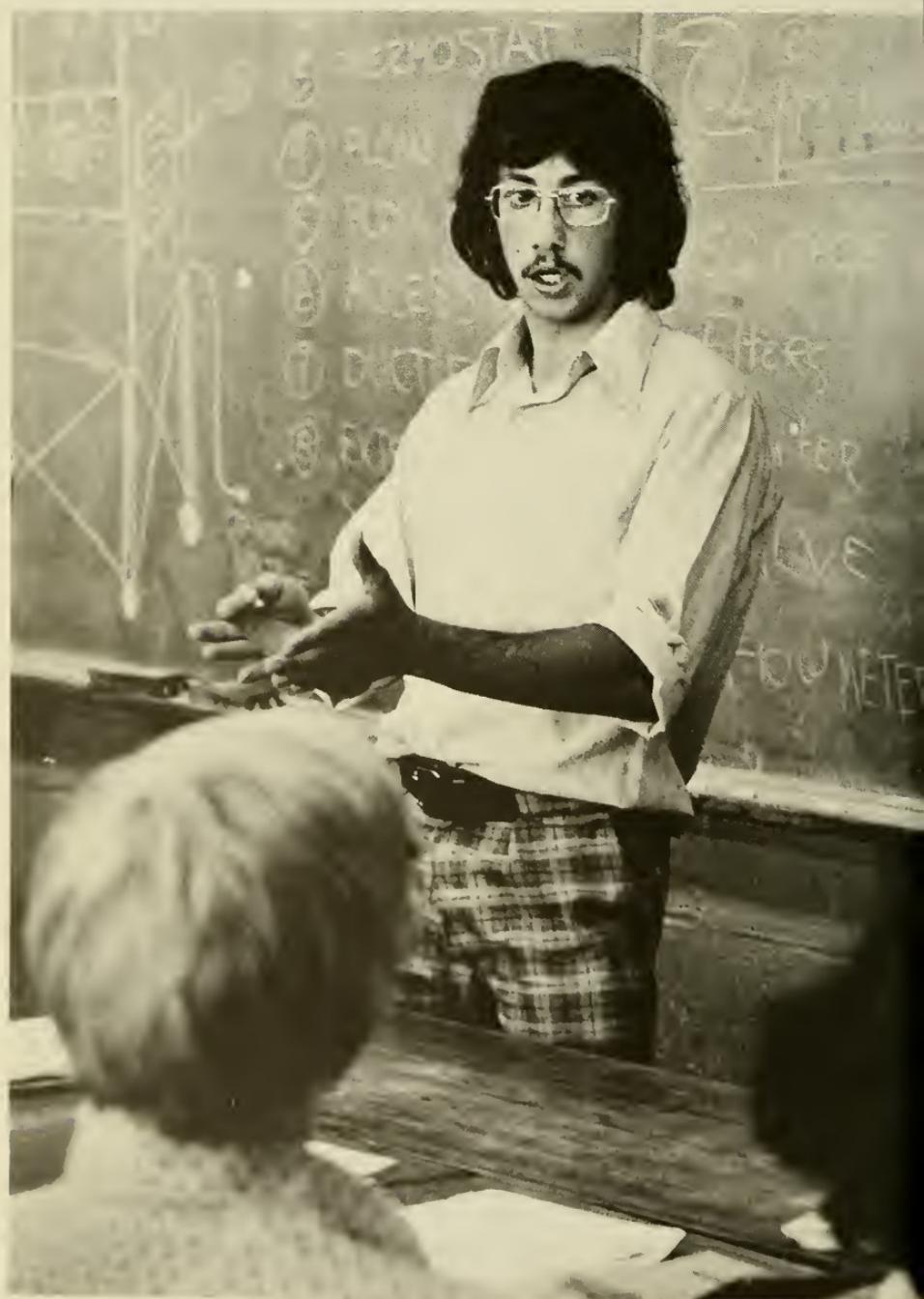
Approval for transfer of credit must be given by the departmental committee in charge of the degree program.

Time Limitation

After admission to the program, a maximum of five years will be allowed for completion of the degree requirements. Extension of this time limit may be granted with the approval of the departmental committee in charge of the degree program.

Registration

All students must register for course work or dissertation as approved by their advisers or the departmental registration officer. After the first registration for this work, registration must be continuous unless withdrawal is allowed by the departmental committee in charge of the degree program.



financial information

FINANCIAL OBLIGATIONS

Tuition

Tuition rates and fees are subject to revision by the Board of Trustees at any time. However, any change in tuition and fees will become effective at the beginning of the school year which follows the one in which the change was announced.

The tuition rate for all graduate students is \$57 per quarter hour of credit. Doctoral candidates actively utilizing the resources of the University in their Doctor of Philosophy or Doctor of Engineering dissertation are charged an additional \$600 per quarter. Those doctoral candidates registered for dissertation work to be performed off campus are charged \$200 per quarter in addition to tuition. All doctoral candidates who are no longer actively utilizing University resources are charged a continuation fee of \$50 per quarter.

Tuition statements are mailed to students by the Bursar's Office and are payable by cash or check to Northeastern University on or before the date specified.

Fees

A \$15.00 non-refundable application fee must accompany the application for admission to the Graduate School of Engineering. No applications will be processed until the fee has been received.

Upon notification of acceptance, all full-time applicants are required to pay a tuition deposit of \$50.00. This deposit will be credited to the student's tuition, and it is not refundable for those who do not register.

Other fees include a charge of \$10 for late payment of tuition and a commencement fee of \$25 for all degree candidates, payable before commencement by the date listed in the academic calendar.

For full-time students there is a charge of \$12.50 per quarter for the services available in the Student Center. The fee for teaching assistants and research fellows is \$6.25 each quarter. All part-time students on the Huntington Avenue Campus are charged \$.75 a quarter.

All full-time students pay a non-refundable University Health Service fee of \$90 each year. This fee will provide Blue Cross-Blue Shield

coverage and entitle the students to the medical care furnished by the University Health Services.

All financial obligations to the University must be discharged by graduation.

Refunds

Tuition refunds will be granted only on the basis of the date appearing on the official withdrawal form filed by the student. Nonattendance does not constitute official withdrawal. Questions regarding refunds should be discussed with the Bursar's Office.

Refunds will be granted in accordance with the following schedule:

Amount of Refund:

Official Withdrawal Filed Within:	Percentage of Tuition
First week of quarter	100
Second week of quarter	75
Third week of quarter	50
Fourth week of quarter	25

FINANCIAL AID

Northeastern University has available the following types of assistantships and fellowships for support of graduate students. Those interested in financial aid must apply through the chairman of the major department. The chairmen or representatives of the Department are listed in the catalog under the Committee on Graduate Study in Engineering.

Teaching Assistantships

Teaching assistantships allowing remission of tuition and a stipend are available in all departments. Holders of such awards devote half time to academic assistance directly related to the teaching function and the balance to course work.

Graduate Administrative Assistantships

Some University departments offer the graduate student an opportunity for remission of tuition and a stipend in return for half time spent in assisting with non-teaching, administrative duties.

Tuition Assistantships

Many departments provide remission of tuition for students who share in the administrative work of the department. These awards are normally given to full-time students in the first year of graduate work.

Research Fellowships

A number of departments offer research fellowships including N.I.H. and N.S.F. that carry a stipend and remit tuition. Certain of these grants require half-time work on research in the department, with the remaining time devoted to course work. Others provide for full-time work on research used for thesis or dissertation.

Martin Luther King, Jr. Scholarships

Established in 1969 in memory of the late Rev. Martin Luther King, Jr., awards are made as openings occur to qualified minority graduate students who show financial need and are accepted to full-time study in the Graduate Schools of the University. Stipends will cover tuition and all fees.

Doctoral Research Fellowships

In the departments which give work leading to the Ph.D. degree, research fellowships available for students who have established candidacy for the Ph.D. degree carry a higher stipend than fellowships at the master's level.

Appointments

Appointments to fellowships and assistantships are ordinarily announced no later than April 15 for the following academic year or summer. Appointments are for a maximum of one year and are not automatically renewed. Students who hold assistantships and research fellowships are expected to devote full time to their studies and the duties of the grant. They may not accept outside employment without the consent of their faculty advisers and the director of the graduate school.

Dormitory Proctorships

A number of proctorships in dormitories on or near the Huntington Avenue campus are available each year. Appointments carry a minimum compensation of room and board. Further information and application forms may be obtained from the Office of University Housing.

National Defense Student Loans

This program is available to students who are carrying at least one-half the normal academic load, are accepted as degree candidates, and who show evidence of financial need.

The Federal maximum a graduate student may borrow is \$5000 while pursuing his post-baccalaureate degree.

Repayment and interest on these loans do not begin until nine months after the student ceases to carry at least a half-time academic load at

an institution of higher education. The repayment of principal may be extended over a ten-year period with the interest at the rate of 3% per annum. Repayment may be deferred up to a total of three years while a borrower is serving as a Peace Corps or VISTA volunteer.

Additional information and application forms are available from the Office of Financial Aid. The application deadline is September 1 for full-time students. For other students the deadline is six weeks prior to the start of the quarter for which aid is requested.

Guaranteed Loan Program

Under this program, students who are matriculated degree candidates, enrolled for at least one-half the normal academic work load, may borrow from a participating bank or other financial institution. Terms and conditions vary from state to state, but a student generally may borrow up to \$1,500 a year (the law allows a maximum of \$2,500 per year) depending on financial need. The Federal government pays the interest while the student is in school if the student is eligible for interest subsidy.

The student must have submitted through the College Scholarship Service, a Parents' Confidential Statement or, if he has been declared financially independent by the Financial Aid Office, a Students' Confidential Statement. These forms are available in the Financial Aid Office.

Applications for the loan itself are available from local banks or the Education Office of your State government. Additional information and necessary application forms for Massachusetts residents are available from the Financial Aid Office.

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civil engineering

Admission

To be enrolled for graduate work leading to the degree of Master of Science in Civil Engineering, applicants must have obtained a Bachelor of Science degree in Civil Engineering, with an acceptable quality of undergraduate work, from a recognized institution. Applicants with a Bachelor of Science degree from a recognized institution in some other engineering field or related science and an appropriate background of preparation may pursue this program and qualify for the degree of Master of Science.

THE MASTER'S DEGREE

General

The master's degree requirements can be completed on the Cooperative Plan, on a full-time basis or part-time in the evening. Forty quarter hours of academic work are required. A master's report carrying 4 Q.H. of credit, or a thesis of 8 Q.H. credit is required* in all fields of civil engineering (environmental, structural and transportation).

A meaningful sequence of electives must be chosen which meets the approval of the department. Department interviews are necessary early in the program for all students in order that an approved program of electives may be arranged with the individual. It is suggested that only required courses be taken in the first quarter. During that quarter an interview should be scheduled within the department for preliminary planning of the remainder of the individual program.

Full-Time Program on the Cooperative Plan

On the Cooperative Plan students enroll for academic work in the Fall and Spring Quarters of the first year and in the Winter Quarter of the second year. The other three quarters of the two academic years and the summer after the first year are available for professional employment. Students who are admitted to a master's degree program under the Cooperative Plan must complete, through satisfactory performance, each cooperative work assignment in order to be eligible for their degree.

* NOTE: This is a new requirement for structural majors and applies to students entering this program in the Fall of 1972.

Full-Time Program

Arrangements may be made to complete the degree requirements in one year on a continuous full-time basis.

Part-Time Programs

The admission requirements for these programs are the same as for the full-time program, but students may progress according to their ability to combine their study load with their employment load. A maximum of seven years is allowed to complete the program.

Substitutions

With the approval of the department, substitutions may be made for some of the prescribed courses by other courses in the department or in other departments which offer graduate work.

Students may petition to substitute eight quarter hours of approved course work for the required four quarter hours Master's Report.

STRUCTURAL ENGINEERING

The Structural Engineering Program emphasizes basic courses in Structural Analysis, Design of Steel and Concrete Structures, and Soil and Rock Mechanics. Advanced topics in Dynamics, Stability, Models and Numerical Methods round out a comprehensive presentation which may be supplemented by offerings from other programs, such as mechanical engineering or industrial engineering.

SPECIMEN DAY PROGRAM

First Academic Quarter	Credits	Second Academic Quarter	Credits
1.847 Structural Analysis ...	4	1.856 Structural Analysis ...	4
1.858 Concrete Structures ..	4	1.861 Design of Structures I	2
1.877 Eng. Props. of Soils ..	4	1.878 Foundation Eng.	4
1.882 Engineering Geology .	2	1.894 Numerical Methods	
		in Struct. Mechanics .	4
(Minimum)	14	1.897 Master's Report	4
		or	
		1.899 Thesis	8
		(Minimum)	14

Third Academic Quarter	Credits
1.855 Concrete Structures III	2
1.857 Structural Dynamics ..	4
1.864 Design of Structures .	4
1.873 Soils Testing Lab.	2
1.897 Master's Report	4
or	
1.899 Thesis	8
(Minimum)	12

PART-TIME PROGRAM

Required Courses	Credits
1.897 Master's Report	4
or	
1.899 Thesis	<u>8</u>

(Minimum) 4

Electives (Part-time Program)

Students in the Structural Engineering major must elect 30 quarter hours from civil engineering courses within the structural engineering field (courses in the 840-899 series).

Six quarter hours may be elected from any courses in engineering or science for which the student has the necessary preparation.

The electives will normally be available according to the following schedule:

Fall Quarter	Credits	Winter Quarter	Credits
1.841 Structural Analysis I .. 2		1.842 Structural Analysis II . 2	
1.844 Structural Analysis IV 2		1.850 Struc. Dynamics I 2	
1.853 Concrete Structures I . 2		1.854 Concrete Structures II 2	
1.859 Structural Stability ... 2		1.862 Design of Structures II 2	
1.861 Design of Structures I 2		1.872 Eng. Props. of Soils II 2	
1.871 Eng. Props. of Soils I . 2		1.875 Soil Mechanics and	
1.874 Soil Mechanics and		Foundation Eng. II ... 2	
Foundation Eng. I 2		1.884 Rock Mechanics I 2	
1.882 Eng. Geology I 2		1.892 Numerical Methods in	
		Struct. Mechanics I .. 2	

Spring Quarter	Credits
1.843 Structural Analysis III . 2	
1.849 Model Analysis 2	
1.851 Struct. Dynamics II ... 2	
1.855 Concrete Structures III 2	
1.863 Design of Structures III 2	
1.873 Soils Testing Lab. ... 2	
1.876 Soil Mechanics and	
Foundation Eng. III .. 2	
1.885 Rock Mechanics II ... 2	
1.893 Numerical Methods in	
Struct. Mechanics II .. 2	

TRANSPORTATION ENGINEERING

The Transportation Engineering Program is designed for students with career goals in transportation engineering, planning, or research. This program consists of courses from engineering, liberal arts, and business. A minimum of 40 credit hours is required for a graduate degree.

A Master of Science in Civil Engineering degree will be awarded to students who have an accredited undergraduate degree in civil engineering and have completed at least 24 quarter credit hours in civil engineering courses, i.e. courses designated with 01--- numbers. A Master of Science degree will be awarded to students who do not have an undergraduate degree in civil engineering or who do not meet the minimum 24 quarter credit hour requirement in civil engineering courses. A student may elect to take non-technical electives in liberal arts and business administration. A maximum of nine credit hours in non-technical fields will be allowed.

Each student is required to prepare a program of study which must be reviewed and approved by his faculty adviser. A typical program of study would normally consist of courses shown in the specimen program. Specimen programs listed below for day and part-time students is intended to show the nature of the program. Substitutions for the courses listed in the specimen programs may be made depending on the student's interest, academic background, and career objectives.

For a complete listing of courses and course descriptions, consult appropriate sections of the graduate school catalogues for Engineering, Liberal Arts, and Business Administration. Further information can be obtained from the Northeastern University catalogue entitled *Graduate Program in Transportation*. This catalogue describes the interdisciplinary program in transportation which leads to a Master of Science in Transportation degree.

SPECIMEN DAY PROGRAM

Required Courses	Credits	Required Courses	Credits
1.834 Transp. Analysis & Planning	4	1.837 Interdisciplinary Urban Transp.	
1.800 Systems Analysis	4	Seminar	2
1.805 Traffic Flow Theory ..	4	1.839 Thesis (Transp.)	6

Suggested Technical Electives

Courses	Credits	Courses	Credits
1.206 Applied Probability for Civil Engineers ...	4	5.950 Engineering Statistics I	2
1.820 Transp. Engineering .	2	5.951 Engineering Statistics II	2
1.806 Urban Transp. Analysis	4	5.913 Data Processing for Engineers	2
1.819 Environmental Impacts of Urban Transp.	4	5.914 Advanced Operations Research	4

Suggested Non-Technical Electives

Courses	Credits	Courses	Credits
22.847 Politics of Transportation	3	39.9P3 Regional Development	3
39.9L5 Economics of Urban Transp.	3	39.9R1 Development Planning	3
39.9J8 Physical Aspects of Urban-Regional Development	3	48.805 Urban Transp. Management	3

PART-TIME PROGRAM

Part-time students are subjected to the same requirements as full-time students. Courses listed above may be taken by part-time students. Some of these courses are not available in the evening, but appropriate substitutions may be made. The following is a list of required courses:

SPECIMEN PART-TIME PROGRAM

Required Courses	Credits	Required Courses	Credits
1.834 Transp. Analysis & Planning	4	1.838 Master's Report (Transportation)	4
1.810 Systems Analysis I ..	2	or	
1.812 Systems Analysis II ..	2	1.839 Thesis (Transp.)	6
1.803 Traffic Flow Theory I ..	2	1.837 Interdisciplinary Urban Transp.	
1.804 Traffic Flow Theory II ..	2	Seminar	2

See Specimen Day Program for suggested Technical and Non-Technical Electives.

ENVIRONMENTAL ENGINEERING

Includes areas of specialization such as water quality management, water and wastewater engineering, environmental health, air pollution control and solid waste management. A day program on the Cooperative Plan is available.

Part-time students and full-time students not on traineeships or grants-in-aid have the option of undertaking either a Master's Report for 4 Q.H. credit or a Master's Thesis for 8 Q.H. credit. (Students on traineeships or with grants-in-aid may be required to complete a Master's Thesis.)

Suggested programs for both full-time and part-time students are given below. Other programs, tailored to meet individual requirements, may be developed through conferences with the student's adviser.

SPECIMEN DAY PROGRAM

First Academic Quarter	Credits	Second Academic Quarter	Credits
1.914 Water & Wastewater Treatment	4	1.922 Env. Bacteriology ...	2
*1.923 Environmental Chem.	4	1.994 Seminar	2
1.933 Environmental Anal.	4	Electives	10
Elective	<u>2</u>		
			<u>14</u>
			14

Third Academic Quarter	Credits
1.912 Water & Wastewater Treatment III	2
Electives	6 or 2
1.993 Master's Report	4
or	
1.991 Thesis	<u>8</u>
(Minimum)	<u>12</u>

PART-TIME PROGRAM

Required Courses	Credits
1.910 Water & Wastewater Treatment I	2
1.911 Water & Wastewater Treatment II	2
1.912 Water & Wastewater Treatment III	2
*1.920 Env. Chemistry I ...	2
*1.921 Env. Chemistry II ...	2
1.922 Env. Bacteriology ...	2
1.930 Env. Analysis I.....	2
1.931 Env. Analysis II	2
1.993 Master's Report	4
or	
1.991 Thesis	<u>8</u>
	<u>20 or 24</u>

Elective Groupings (Day and Part-Time)

Forty (40) quarter hours of academic work are required for the degree, including certain approved electives which are available from other departments. To provide a meaningful grouping of the available technical electives, one of the following sequences of courses must be selected. These are the required courses for each area of specialization. A minimum of 14 quarter hours of elective courses must be ob-

* These required courses may be waived for those students who have taken North-eastern course 1.223, Environmental Chemistry, or equivalent. Course 1.933 or courses 1.930 and 1.931 will be required of all students.

tained from environmental engineering courses offered by the Civil Engineering Department (900 series). Exceptions to these requirements must receive permission from the Engineering Graduate Committee.

Water and Wastewater Engineering	Credits	Environmental Health Engineering & Science	Credits
1.935, 1.936 Environmental Lab (U.O.)	4	1.985 Environmental Protection	2
1.907 W.R. Planning III ...	2	or	
1.954 Stream Sanitation ..	2	1.940 Public Health Survey	2
1.913 Ind. Waste Disposal .	2	1.950 Air Pollution	2
1.994 Environmental Eng. Seminar (Trainees Only)	2	1.951 Rad. Health	2
Additional Electives	4 or 8	1.952 Ind. Hygiene	2
		1.996 Env. Health Seminar (Trainees Only)	2
		1.955 Air Sampling Analysis	2
		Additional Electives	4 or 8

Water Resources Planning	Credits	Air Pollution Engineering	Credits
1.905, 1.906, 1.907, W.R. Planning	6	1.800 C.E. Systems	4
1.906, 1.961, 1.962, Hydr. Structure	6	1.950 Air Pollution	2
1.901, 1.902, 1.903 Hydraulics	6	1.956 Env. Health Seminar	2
Additional Electives	2	1.955 Air Sampling & Analysis	2
		1.957 Air Science	2
		Additional Electives	4 or 8

Civil Engineering (Geotechnical)

At the master's degree level it is possible to undertake concentrated study in geotechnical engineering which is concerned with materials within the earth's crust. Students with this interest should consider the following courses recommended by the Civil Engineering Department to obtain a competent knowledge in the field.

Courses	Credits
1.871 Eng. Prop. of Soils I ...	2
1.872 Eng. Prop. of Soils II .	2
1.873 Soils Testing Lab. ...	2
1.874 Soil Mechanics and Foundation Eng. I ...	2
1.875 Soil Mechanics and Foundation Eng. II ...	2
1.876 Soil Mechanics and Foundation Eng. III ..	2
1.882 Engineering Geol. ...	2
1.884 Rock Mechanics I	2
1.885 Rock Mechanics II ...	2

THE DOCTOR'S DEGREE**Environmental Engineering
Full-Time Program**

The following material outlines the procedures for admission to the doctoral program in environmental engineering and the steps necessary to qualify for the Ph.D. degree. For further information applicants should write to the Chairman of the Ph.D. Committee, Department of Civil Engineering.

Admission

Each student admitted to the program will initially have the status of doctoral student. In the usual case, he will have received a master's degree in an appropriate field of engineering or science prior to entry into the program. Applicants should apply to the Chairman of the Ph.D. Committee, Department of Civil Engineering for admission to the doctoral program, preferably by February 1st. The departmental graduate committee will interview the applicant, examine his record, and decide whether he should be admitted to the program. The chairman of the department will appoint a program adviser for each doctoral student, upon the recommendation of the departmental graduate committee.

Residence Requirement

The residence requirement is satisfied by one year of full-time graduate work after admission as a doctoral student. However, it is expected that at least two years of full-time graduate study will be required beyond the master's degree.

Degree Candidacy

Degree candidacy is established in accordance with the general graduate school regulations. At least one year of full-time study and successful completion of the qualifying examination are required for consideration as a doctoral degree candidate.

Qualifying Examination

The qualifying examination will consist of a written and an oral section. The written part will cover: (1) environmental engineering and/or science and (2) selected areas depending upon the educational background and interest of the student. In certain cases the student may be exempted from the written part of the examination. The oral portion will measure general comprehension. If the oral examination is failed, it may be repeated with permission of the departmental graduate committee. The qualifying examination shall be completed no later than two years after admittance as a doctoral student.

Comprehensive Examination

The comprehensive examination is given after the thesis has been completed. This examination is based upon the defense of the thesis.

Course Requirements

Course requirements for each applicant will be determined by the departmental graduate committee. Formal course work will be selected to meet the individual student's objectives. Graduate level study up to 12 quarter hours of course work, completed under programs other than this full-time program may be accepted, but requires approval of the departmental graduate committee.

Thesis

After degree candidacy has been established, a candidate must complete a thesis which embodies the results of extended research and includes material suitable for publication.

A thesis committee will be appointed by the chairman of the departmental graduate committee. The thesis committee, consisting ordinarily of five members, two of whom are from other departments, will be informed of the progress of the thesis and will be responsible for its approval.

Language Requirement

A reading knowledge of one foreign language is required. The requirement shall be determined in a manner prescribed by the departmental graduate committee, and must be satisfied prior to taking the oral qualifying examination.

mechanical engineering

Admission

To be enrolled for graduate work leading to the degree of Master of Science in Mechanical Engineering, applicants must have obtained a Bachelor of Science degree in Mechanical Engineering, with an acceptable quality of undergraduate work, from a recognized college or university. Applicants with a Bachelor of Science degree in other engineering or related science fields and an appropriate background of preparation may pursue this program and qualify for the degree of Master of Science without specification.

THE MASTER'S DEGREE

REQUIRED COURSES

Mechanics Major	Credits	Materials Major	Credits
2.826 Math. Methods for Mech. Eng. I	2	2.826 Math. Methods for Mech. Eng. I	2
2.827 Math. Methods for Mech. Eng. II	2	2.827 Math. Methods for Mech. Eng. II	2
2.804 Theory of Elasticity .. and	2	2.954 Adv. Physical Met. I .. 2.956 Adv. Physical Met. II ..	2 2
2.805 Theory of Elasticity .. or	2	2.970 Mat. Sci. and Eng. 2.971 Mat. Sci. and Eng.	2 2
2.819 Fluid Dynamics I and	2	2.804 Theory of Elasticity .. or	2
2.820 Fluid Dynamics II	2	2.960 Thermo. of Materials .. and	2
2.841 Vibration Theory and	2	2.961 Thermo. of Materials ..	2
2.842 Vibration Theory or	2		<hr/> 14 or 16
2.849 Automatic Cont. Eng. and	2		
2.850 Automatic Cont. Eng. and	2		
2.851 Automatic Cont. Eng.	2		
	<hr/> 12 or 14		

Thermo-Fluids Major	Credits	Ocean Engineering Major	Credits
2.826 Math. Methods for Mech. Eng. I	2	(open to continuous full-time and cooperative plan students only)	
2.827 Math Methods for Mech. Eng. II	2	2.826 Math. Methods for Mech. Eng. I	2
2.819 Fluid Dynamics I	2	2.827 Math. Methods for Mech. Eng. II	2
2.820 Fluid Dynamics II	2	2.819 Fluid Dynamics I	2
2.901 Adv. Thermodynamics	2	2.820 Fluid Dynamics II	2
2.902 Adv. Thermodynamics	2	2.870 Ocean Engineering I .	2
2.910 Conduction Heat Trans.	2	2.871 Ocean Engineering II .	2
2.911 Convection Heat Trans.	2	2.873 Geophysical Eng.	2
	16	2.874 Ocean Measurements	2
			16

In addition, 2.990 Seminar and 2.991 Thesis are required for continuous full-time and cooperative plan students in all majors.

Electives

Students must take sufficient mechanical engineering departmental electives so that the required courses in their major and the departmental electives total at least 30 of the 40 quarter hours required for the degree.

The remaining ten credits may be elected from any courses in engineering or science for which the student has the necessary preparation.

Full-Time Program on the Cooperative Plan

Forty quarter hours of academic work are required. This program may be taken on the Cooperative Plan where students enroll for academic work in the Fall and Winter Quarters of the first year and in the Fall and Winter Quarters of the second year. The other quarters of the two academic years and the summer after the first year are available for professional employment. Students who are admitted to a master's degree program under the Cooperative Plan must complete, through satisfactory performance, each cooperative work assignment in order to be eligible for their degree.

A thesis of ten quarter hours of credit is required unless waived by the department graduate committee.

Majors in mechanics, materials, thermo-fluids, and ocean engineering are available. The sequence of courses on the Cooperative Plan will normally be taken according to the following pattern:

MECHANICS MAJOR

First Academic Quarter	Credits	Second Academic Quarter	Credits
2.826 Math. Methods for Mech. Eng. I	2	2.827 Math. Methods for Mech. Eng. II	2
2.804 Theory of Elast. or	2	2.805 Theory of Elast. or	2
2.819 Fluid Dynamics I	2	2.820 Fluid Dynamics II	2
2.841 Vibration Theory	2	2.842 Vibration Theory	2
or		or	
2.849 Automatic Cont. Eng. . Electives	2 4	2.850 Automatic Cont. Eng. . Electives	2 4
	<u>10</u>		<u>10</u>

Third Academic Quarter	Credits	Fourth Academic Quarter	Credits
2.990 Seminar	1	2.990 Seminar	1
2.991 Thesis	5	2.991 Thesis	5
Electives	<u>4</u>	Electives	<u>4</u>
	<u>10</u>		<u>10</u>

MATERIALS MAJOR

First Academic Quarter	Credits	Second Academic Quarter	Credits
2.804 Theory of Elasticity .. or	2	Elective	2
2.960 Thermodynamics of Materials	2	2.961 Thermodynamics of Materials	2
2.970 Material Science & Engineering	2	2.971 Material Science & Engineering	2
or		or	
2.954 Advanced Physical Metallurgy I	2	2.956 Advanced Physical Metallurgy II	2
2.826 Math. Methods for Mech. Eng. I	2	2.827 Math. Methods for Mech. Eng. II	2
Electives	<u>4</u>	Electives	<u>4</u>
	<u>10</u>		<u>10</u>

Third Academic Quarter	Credits	Fourth Academic Quarter	Credits
2.954 Advanced Physical Metallurgy I or		2.956 Advanced Physical Metallurgy II or	
2.970 Material Science & Engineering	2	2.971 Material Science & Engineering	2
2.990 Seminar	1	2.990 Seminar	1
2.991 Thesis	5	2.991 Thesis	5
Elective	<u>2</u>	Elective	<u>2</u>
	<u>10</u>		<u>10</u>

THERMO-FLUIDS MAJOR

First Academic Quarter	Credits	Second Academic Quarter	Credits
2.819 Fluid Dynamics I	2	2.820 Fluid Dynamics II	2
2.826 Math. Methods for Mech. Eng. I	2	2.827 Math. Methods for Mech. Eng. II	2
2.901 Advanced Thermodynamics	2	2.902 Advanced Thermodynamics	2
2.910 Conduction Heat Transfer	2	2.911 Convection Heat Transfer	2
Elective	<u>2</u>	Elective	<u>2</u>
	<u>10</u>		<u>10</u>

Third Academic Quarter	Credits	Fourth Academic Quarter	Credits
2.990 Seminar	1	2.990 Seminar	1
2.991 Thesis	5	2.991 Thesis	5
Electives	<u>4</u>	Electives	<u>4</u>
	<u>10</u>		<u>10</u>

OCEAN ENGINEERING MAJOR

First Academic Quarter	Credits	Second Academic Quarter	Credits
2.819 Fluid Dynamics I	2	2.820 Fluid Dynamics II	2
2.826 Math. Methods for Mech. Eng. I	2	2.827 Math. Methods for Mech. Eng. II	2
2.870 Ocean Engineering I	2	2.871 Ocean Engineering II	2
2.873 Geophysical Engineering	2	2.874 Ocean Measurements	2
Elective	<u>2</u>	Elective	<u>2</u>
	<u>10</u>		<u>10</u>

Third Academic Quarter	Credits	Fourth Academic Quarter	Credits
2.990 Seminar	1	2.990 Seminar	1
2.991 Thesis	5	2.991 Thesis	5
Electives and/or Marine Biology	<u>4</u>	Electives	<u>4</u>
	<u>10</u>		<u>10</u>

Continuous Full-Time Program

Students may take the 40 quarter hours of academic work on a continuous full-time basis and complete the degree requirements in one academic year. The sequence of courses which students take on this plan is established by their adviser.

Electives

With the approval of the adviser, a maximum of ten quarter hours of credit may be elected from graduate courses in other departments.

Part-Time Programs

The admission requirements for these programs are the same as for the full-time program, but students may progress according to their abilities and the time available. All majors except ocean engineering are offered on a part-time basis in the evening.

Advisers For Part-Time Programs

The following faculty should be contacted by part-time graduate students if information is required relative to any scholastic problems.

- | | |
|-------------------------------|----------------------|
| Materials major | Prof. Richard Murphy |
| Mechanics major | Prof. John Rossettos |
| Thermo-Fluids major | Prof. Warren Nelson |
| Ocean Engineering major | Prof. Thomas Phalen |

THE MECHANICAL ENGINEER DEGREE

The Department of Mechanical Engineering offers the graduate degree of Mechanical Engineer for those who wish to undertake graduate study beyond the master's degree without committing themselves to a program as extensive as that required for the doctor's degree. The degree permits a candidate to pursue a course of study at the upper graduate level in more than one area of mechanical engineering.

The following material outlines the procedures for admission to the Mechanical Engineer degree program and the steps necessary to qualify for the degree. For further information applicants should write to the Mechanical Engineering Graduate Committee, Room 75, Richards Hall, Northeastern University, Boston, Ma. 02115.

Admission

To be admitted to candidacy for the degree of Mechanical Engineer, the applicant will have obtained the degree of Master of Science in Mechanical Engineering, or its equivalent, from a recognized institution. In some cases, where the Master's degree is not in Mechanical Engineering, the applicant may be admitted to the program on a conditional basis with the stipulation that certain deficiencies be removed without credit toward the degree. Such special admission is dependent upon the approval of the Mechanical Engineering Graduate Committee.

Each applicant must submit to the Graduate Committee, prior to April 1, transcripts of his undergraduate and graduate records and three letters of recommendation which indicate his ability to carry out advanced graduate work.

In general, it is assumed that the applicant will choose two areas of emphasis in his graduate program of study. An outline of his program must be submitted to the Graduate Committee for approval. It is recommended that the applicant discuss his program with the Graduate Committee and members of the graduate faculty in his areas of emphasis prior to submission of his program for approval.

Classification and Degree Candidacy

A student admitted to the Engineer degree program will be designated as a candidate for this degree.

Residence Requirement

The residence requirement is satisfied by two academic quarters of full-time graduate work during the academic year or by four academic quarters of half-time graduate work during two consecutive academic years. Plans for satisfying the residence requirement on a half-time basis must be approved in advance by the Graduate Committee.

Qualification and Examinations

A student must maintain a "B" average to qualify for the degree. Students admitted on a conditional basis may be required to pass special examinations. The Graduate Committee will determine the need for and will administer any such special examinations. A final oral examination consisting of a defense of the dissertation may be required if the candidate's adviser and the Departmental Graduate Committee so decides.

Credit Requirements

A minimum of 40 quarter-hours of credit beyond the master's degree is required. Up to 10 quarter-hours of credit will be permitted for work on a dissertation. A minimum of 20 quarter-hours of credit must be in the Mechanical Engineering Department.

Dissertation

To be awarded the Mechanical Engineer degree each candidate must complete a separate dissertation demonstrating a high level of competence in research, development, or design in the field of Mechanical Engineering. The effort normally expected will be the equivalent of 10 quarter-hours of graduate course work.

Transfer Credits

Any transfer of credits must be approved by the Graduate Committee.

Time Limitation

After admission to the program a maximum of five years will be permitted for completion.

Registration

All students must register with the Departmental Registration Officer for course work or dissertation approved by the Graduate Committee or the student's adviser. After the first registration for this work, registration must be continuous unless withdrawal is allowed by the Graduate Committee.

THE DOCTOR'S DEGREE

The following material outlines the procedure for admission to the doctoral program and the steps necessary to qualify for the Ph.D. degree. For further information, applicants should write to the Chairman of the Department of Mechanical Engineering.

Admission

Applicants who are enrolled as candidates for the degree of Master of Science in Mechanical Engineering at Northeastern University should apply in writing to the Chairman of the Department of Mechanical Engineering for admission to the doctoral program. Such application must be made by February 1st of the year in which they expect to receive the master's degree. The departmental graduate committee will examine the record of the applicant and decide whether or not he should be allowed to take the qualifying examination.

Applicants who are enrolled for graduate work at other institutions or who have completed the requirements for the master's degree should write the chairman of the department for an application for an interview. This form, transcripts of all undergraduate and graduate work, together with three letters of recommendation must be transmitted to the chairman of the departmental graduate committee. The applicant will be notified of an interview time and, after the interview, will be advised if he will be invited to take the qualifying examination and if he should make formal application for admission to the doctoral program. The application for interview, transcripts, and letters of recommendation must be received by February 1st if the March qualifying examination is to be taken.

Residence Requirement

The residence requirement is satisfied by one year of full-time graduate work or by two years of half-time graduate work beyond the master's degree. However, a student should expect to spend at least two years, or the equivalent, in full-time graduate study beyond the requirements of the master's degree.

Degree Candidacy

After 40 quarter hours of graduate work have been taken with satisfactory grades and upon successful completion of the qualifying examination, a student is established as a degree candidate.

Qualifying Examination

The qualifying examination in the Department of Mechanical Engineering is offered yearly in March and/or April and is both written and oral. The written portion of the qualifying examination is six hours in length and covers, with equal emphasis, four different areas. A student

must select one area from each of the three groups A, B, and C plus another area either listed below or unlisted, but considered equivalent and approved by the graduate committee.

A.	B.
Concepts of Thermodynamics	Dynamics
Applied Thermodynamics	Mechanics of Deformable Bodies
C.	
Heat and Mass Transfer	
Fluid Mechanics	
Mechanical Behavior of Materials	
Physical Metallurgy	

The oral portion of the qualifying examination is conducted by a committee consisting of at least four members appointed by the graduate committee. A typical committee is composed of two members specializing in the student's major area plus one member from each of two other areas.

The qualifying examination may be taken by a graduate student who expects to complete the requirements for his master's degree within three months of the date of the qualifying examination as well as by a person who has already completed the requirements for the master's degree. Because degree candidacy must be established before the graduate committee will act to approve course programs or thesis proposals, the qualifying examination should be taken at the earliest opportunity. If the examination is failed, it may be repeated with permission of the departmental graduate committee.

Course Requirements

To receive the Ph.D. degree a candidate must complete a program of course work approved by the graduate committee. Courses completed prior to admittance to the doctoral program are subject to the approval of the graduate committee. Each program must contain at least twelve quarter hours of course work, preferably outside of the department, in an area other than that in which the candidate is majoring. Attainment of a B average for the courses in the "minor" portion of the program will signify satisfactory completion of that portion.

Thesis

After degree candidacy has been established, a candidate must complete a thesis which embodies the results of extended research and includes materials suitable for publication.

The departmental graduate committee may require the completion of certain course work before permitting thesis work to commence. A thesis committee will be appointed by the chairman of the department upon the recommendation of the departmental graduate committee.

The thesis committee will be kept informed of the progress of the thesis and will be responsible for initial approval of the thesis in its final form.

Language Requirement

A reading knowledge of one foreign language is required. Proficiency in a language shall be determined in a manner prescribed by the departmental graduate committee. The language requirement must be satisfied no later than six months before the time at which the degree is to be conferred.

Comprehensive Examination

The comprehensive examination is combined with the final oral examination and is given after the thesis has been completed and approved. This examination is based upon the subject matter of the thesis and a defense of it.

Final Oral Examination

The final oral examination is taken after completion of all other requirements for the degree. This examination cannot be held until two weeks have elapsed after the thesis has been registered and accepted by the graduate school and must be passed at least two weeks before the commencement at which the degree is to be awarded.

The final oral examination will include the subject matter of the doctoral thesis and significant developments in the field of the thesis work. Other fields may be included if recommended by the examining committee.

electrical engineering

Admission

To be enrolled for graduate work leading to the degree of Master of Science in Electrical Engineering, applicants must have obtained a Bachelor of Science degree in Electrical Engineering, with an acceptable quality of undergraduate work, from a recognized college or university. Applicants with a Bachelor of Science degree in other engineering or related science fields and an appropriate background of preparation may pursue this program and qualify for the degree of Master of Science without specification. In some cases, students whose Bachelor of Science degree is in some other engineering or related science field may qualify for the degree of Master of Science in Electrical Engineering. This requires special approval of the Department of Electrical Engineering.

THE MASTER'S DEGREE

Full-Time Program on the Cooperative Plan

Forty quarter hours of academic work are required. This program may be taken on the Cooperative Plan. On this plan one group of students takes academic work in the Fall and Spring Quarters of the first year and in the Winter Quarter of the second year. Another group may take the academic work in the Winter Quarter of the first year and in the Fall and Spring Quarters of the second year. In either case, the other three quarters of the two academic years and the summer after the first year are available for professional employment. Students who are admitted to a master's degree program under the Cooperative Plan must complete, through satisfactory performance, each cooperative work assignment in order to be eligible for their degree.

The sequence of courses on the Cooperative Plan will normally be taken according to the following pattern:

First Academic Quarter	Credits	Second Academic Quarter	Credits
3.827 Linear Systems Analysis	4	3.832 Network Synthesis I	4
3.842 Linear Active Circuits	4	3.990 Seminar I	2
3.823 Mathematical Methods in Electrical Engineering	4	3.902 Appl. Prob. & Stoch. Proc.	4
Electives	2 or 4	Electives	4 or 6
			<hr/>
			14 or 16
			<hr/>
	14 or 16		

Third Academic Quarter		Credits
3.877 Electromagnetic Theory	4	
3.991 Seminar II	2	
Electives	8 or 10	
		14 or 16

A limited amount of work may be elected from the part-time program.

A thesis for six quarter hours credit is elective with the approval of the chairman of the department. If the thesis option is approved, this work is done in the second year of the program. Details concerning thesis proposals, editorial format, and time schedules are available in the Graduate School Office.

The program of each student will be made up from the required and elective courses available in each term and approved by the student's academic adviser.

Electives

The electives will normally be available according to the following schedule:

Fall Quarter

- 3.902 Applied Probability and Stochastic Processes
- 3.959 Control Theory I — Analysis and Synthesis
- 3.979 Electronic Digital Computers

Winter Quarter

- 3.902 Applied Probability and Stochastic Processes
- 3.909 Detection and Estimation Theory
- 3.962 Control Theory II — Nonlinear and Sampled-Data Systems
- 3.979 Electronic Digital Computers

Spring Quarter

- 3.8T9 Digital Filtering
- 3.902 Applied Probability and Stochastic Processes
- 3.905 Information Theory and Coding
- 3.954 Systems Analysis
- 3.965 Control Theory III — Optimal Control and Stochastic Systems

(Additional electives will be available from the late afternoon portion of the part-time program in all quarters.)

Full-Time Program

For those students whose programs would be better served by full-time study the prescribed courses may be taken in one academic year. The sequence of the required courses will be different from the full-time program on the Cooperative Plan.

POWER SYSTEMS MAJOR

Full-Time Program on the Cooperative Plan

Three organizational modes are offered in our Power Systems Engineering Program which lead to an M.S. in Electrical Engineering.

One may take the course work on the Northeastern Cooperative Plan combining alternate periods of study with work periods in power related areas; one may study full time, or one may take the curriculum on a part-time basis in the evening. The length of time required varies a bit with the student's background, but generally can be computed on the basis of a minimum of 40 quarter hours of course work.

For students enrolled in Northeastern's Power Systems Program at the undergraduate level, it is possible (and customary) to take 8 q.h. of credit toward the M.S. over the last two undergraduate years. These courses usually comprise 3.902 Probability and 2.237 Nuclear Engineering II, but other options (e.g. 3.959 Control Systems I, 3.295 Numerical Methods and Computer Applications) are acceptable. This permits a student to finish quite readily in one year on the Cooperative Plan. Students from Power Systems Programs at other universities are welcome to explore this option with the Director of the Power Systems Engineering Program.

A student in the one year cooperative program (with 8 q.h. of credits towards the M.S. prior to the start of the sixth year) would take the following program.

Fall Quarter	Credits	Spring Quarter	Credits
3.827 Linear Systems Analysis	4	3.931 Power System Planning	4
3.928 Analysis of Power Systems	4	3.938 Comp. Control & Analysis in Power Systems	4
3.990 Seminar	2	3.991 Seminar	2
Electives	<u>6-8</u>	Electives	<u>4-6</u>
	<u>16-18</u>		<u>14-16</u>

Total Must Equal 32

Students planning a part-time program (evening) should consult the listing under Part-time Program for their requirements.

Electives

For electives, all power students should consider selections from the list below. These are marked as day (D) or evening (E) and by quarter offered. Other suitable graduate courses are possible with the approval of the Director of the Power Systems Engineering Program.

Course Number	Course	Day or Evening	Quarter	Credits
2.920, 2.921	Direct Energy Conv.	E		2 ea.
2.932, 2.933, 2.934	Pollution Probs. from Comb.	E	F,W,S	2 ea.
2.935, 2.936	Pwr. Plant Econ. & Design	E	F,W	2 ea.
3.810, 3.811, 3.812	Therm. Fusion Ener. I, II, III	E	F,W,S	2 ea.
3.930	Pwr. Syst. Planning	E	S	2
3.931	Pwr. Syst. Planning	D	S	4
3.932	Pwr. Syst. Protection	E	F	2
3.933	Pwr. Syst. Transients	E	W	2
3.935, 3.936, 3.937	Computers in Pwr. Syst.	E	F,W,S	2 ea.
3.938	Computer Control & Anal. in Pwr. Syst.	D	S	4
3.940, 3.941, 3.942	Electric Mach.	E	F,W,S	2 ea.
3.943	Adv. Pwr. Lab	D	by arrangement	
3.944	Special Topics in Pwr.	D	by arrangement	
3.945	Pwr. Syst. Trans. Stab.	E	F	2
3.946	MHD Energy Conv.	E	W	2
3.947	H.V.D.C. Pwr. Trans.	E	S	2

Part-Time Program Electrical Engineering

Admission

The admission requirements for the part-time program leading to the degree of Master of Science in Electrical Engineering are the same as for the full-time program, but students may progress according to their abilities and the time available.

All graduate courses presuppose mastery of the subject matter of a modern, fully accredited curriculum in electrical engineering. Applicants who have not taken further academic work for some time since they received their bachelor's degree may be required to take graduate courses to satisfy any deficiencies. For this purpose, the following courses are available:

		Credits
3.975	Precis of Modern Electrical Engineering I	2
3.976	Precis of Modern Electrical Engineering II	2
3.977	Precis of Modern Electrical Engineering III	2
3.978	Precis of Modern Electrical Engineering IV	2

These courses carry graduate credit but a maximum of four quarter hours of credit from this group may be used as elective credit in the degree program.

Program

Forty quarter hours of academic work are required for the master's degree of which 16 quarter hours of credit are specified as follows:

Required Courses		Credits
3.825	Linear Systems Analysis II-A	2
3.826	Linear Systems Analysis II-B	2
*3.840	Linear Active Circuits I-A	2
*3.841	Linear Active Circuits I-B	2
3.875	Electromagnetic Theory A	2
3.876	Electromagnetic Theory B	2
3.8C1	Mathematical Methods in Electrical Engineering I-A and	2
3.8C2	Mathematical Methods in Electrical Engineering I-B or	2
3.8C4	Mathematical Methods in Electrical Engineering II-A and	2
3.8C5	Mathematical Methods in Electrical Engineering II-B or	2
3.900	Applied Probability and Stochastic Processes A .. and	2
3.901	Applied Probability and Stochastic Processes B ..	2

Students lacking the necessary prerequisites for 3.8C1 or 3.8C4 may be required to take undergraduate courses 3.292 or 3.293 to clear this deficiency. By petition, these courses may carry graduate credit.

Electives

In addition to the required course work each student is expected to select a major and a minor area from the list given below. Ten quarter hours of credit must be taken in the major area and six quarter hours of credit taken in the minor area. The area or areas to which a course is assigned is indicated in the following listings. Not every course is assigned to an area. They may be used as one of the free elective courses. Eight quarter hours of credit are free electives which may be selected from graduate courses in sciences or other engineering departments for which the student has the necessary preparation.

Subject Areas**1. Circuits and Systems**

3.830	3.838	3.911
3.831	3.839	3.912
3.832	3.843	3.950
3.833	3.845	3.951
3.834	3.860	3.952
3.835	3.861	3.953
3.837	3.910	3.954

* Evening part-time students who wish to major in Power Systems should substitute 3.925, 3.926 and 3.927, Power Circuit Analysis (2 credits per quarter) for 3.840 and 3.841.

2. Computer Science		4. Communications and Control	
3.837	3.935	3.817	3.905
3.860	3.936	3.818	3.906
3.861	3.937	3.819	3.907
3.892	3.967	3.865	3.908
3.893	3.968	3.866	3.909
3.894	3.969	3.867	3.9C1
3.895	3.972	3.871	3.9C2
3.898	3.973	3.872	3.957
3.899	3.974	3.873	3.958
3.8T1	3.979	3.898	3.959
3.8T2	3.985	3.899	3.960
3.8T3	3.986	3.900	3.961
3.8T7	3.987	3.901	3.962
3.8T8	3.988	3.902	3.963
3.8T9	3.989	3.903	3.964
		3.904	3.965
3. Fields, Waves and Optics		5. Physical Electronics	
3.800	3.890	3.806	3.854
3.801	3.891	3.807	3.8G1
3.802	3.913	3.808	3.8G2
3.806	3.914	3.853	3.8G3
3.807	3.915		
3.808	3.916	6. Power Systems	
3.810	3.917	2.920	3.933
3.811	3.918	2.921	3.935
3.812	3.919	2.935	3.936
3.817	3.920	2.936	3.937
3.818	3.921	3.810	3.938
3.819	3.922	3.811	3.940
3.878	3.923	3.812	3.941
3.879	3.924	3.925	3.942
3.880	3.980	3.926	3.943
3.881	3.981	3.927	3.944
3.882	3.982	3.928	3.945
3.883	3.983	3.930	3.946
3.885	3.984	3.931	3.947
		3.932	3.948

Quarter-Sequence Courses

Certain courses have an A or B after the course title. In these cases, credit will be given toward the degree only if both the A and B courses are successfully completed.

ELECTRO-OPTICS PROGRAM

The Electro-Optics Program is designed to provide the engineer and scientist with a working knowledge of current electro-optical techniques and systems. Emphasis is placed on application to industrial and research problems.

Admission

To be enrolled for this degree program, applicants must have a Bachelor of Science degree in Electrical Engineering or Physics, with an acceptable quality of undergraduate work from a recognized institution. Admission requirements are those of the regular program in electrical engineering.

Program

Forty quarter hours of academic work are required, of which 18 are specified. At least 12 additional hours of electives in optics are to be chosen from the optics elective listed below. The remaining ten hours may be selected from optics electives or from suitable courses in science or engineering.

Specified Courses	Credits
3.8C1 Math. Methods in Elec. Eng. I-A	2
or	
3.8C4 Math. Methods in Elec. Eng. II-A	2
3.8C2 Math. Methods in Elec. Eng. I-B	2
or	
3.8C5 Math. Methods in Elec. Eng. II-B	2
3.914 Electro-Optics I	2
3.915 Electro-Optics II	2
3.916 Fourier-Optics I	2
3.917 Fourier-Optics II	2
3.918 Experimental Optics I	2
3.919 Experimental Optics II	2
3.920 Experimental Optics III	2

Optics Electives	Credits
3.806 Lasers I	2
3.807 Lasers II	2
3.808 Laser Applications	2
3.913 Optical Storage and Display	2
3.921 Optical Properties of Matter I	2
3.922 Optical Properties of Matter II	2
3.923 Optical Properties of Matter III	2
3.924 Advanced Topics in Electro-Optics	2
3.980 Optical Instrument Design Concepts	2
3.981 Principles of Optical Detection I	2
3.982 Principles of Optical Detection II	2
3.983 Fourier Optics III	2
3.984 Spectroscopic Instrumentation	2

MODEL PROGRAM IN ELECTRO-OPTICS

First Year	Credits	Second Year	Credits
3.8C4 Math. Meth. in Elec. Eng. II-A	2	3.915 Electro-Optics II	2
3.8C5 Math. Meth. in Elec. Eng. II-B	2	3.916 Fourier Optics I	2
3.914 Electro-Optics I	2	3.917 Fourier Optics II	2
3.806 Lasers I	2	3.918 Experimental Optics I .	2
3.807 Lasers II	2	3.919 Experimental Optics II	2
3.808 Laser Applications ...	<u>2</u>	3.920 Experimental Optics III	<u>2</u>
	<u>12</u>		<u>12</u>
Third Year		Credits	
3.913 Optical Storage and Display	2		
3.921 Optical Properties of Matter I	2		
3.922 Optical Properties of Matter II	2		
3.981 Prin. Optical Det. I ...	2		
3.982 Prin. Optical Det. II ..	2		
3.984 Spectroscopic Instr. ...	<u>2</u>		<u>12</u>

Four additional hours of electives are required for a total of 40 credits for the degree.

Course Prerequisites

The prerequisites suggested for each course are given so that the student will receive full benefit from the course. In case of doubt, the student should consult the Director of the Electro-Optics Program or the course instructor.

COMPUTER SCIENCE MAJOR

The Computer Science Program is structured to provide a curriculum of study in computer science and engineering leading to the degree of Master of Science in Electrical Engineering, or Master of Science, with a major in Computer Science.

Admission

To be enrolled for this degree program, applicants must have obtained a Bachelor of Science degree in engineering, mathematics, or the physical sciences from a recognized college or university and must present satisfactory evidence of ability to pursue graduate study.

Program

Forty quarter hours of academic work are required, of which 14 are specified and 26 are elective.

Specified Courses	Credits
3.893 Digital Computer Programming I	2
3.894 Digital Computer Programming II	2
3.895 Digital Computer Programming III	2
3.972 Electronic Digital Computers I	2
3.973 Electronic Digital Computers II	2
3.8T1 Numerical Methods and Computer Applications I	2
3.8T2 Numerical Methods and Computer Applications II	2

Electives

Sixteen quarter hours of credit must be chosen from the following list of courses. It is urged that students take both of the courses in any two-quarter sequence they elect, and at least two courses in any three-quarter sequence they elect.

3.837	Introduction to Graph Theory
3.898	Combinatorial & Optimization Techniques I
3.899	Combinatorial & Optimization Techniques II
3.8T3	Numerical Methods and Computer Applications III
3.8T7	Digital Filtering I
3.8T8	Digital Filtering II
3.904	Error Correcting Coding
3.908	Special Topics in Communication Theory
3.967	Switching Circuits I
3.968	Switching Circuits II
3.969	Switching Circuits III
3.974	Electronic Digital Computers III
3.985	Fundamentals of Automatic Digital Computation I
3.986	Fundamentals of Automatic Digital Computation II
3.987	Fundamentals of Automatic Digital Computation III
3.988	Special Topics in Computer Science
3.989	Computer Peripherals
3.995	Thesis
3.998	Special Problems in Electrical Engineering
5.911	Linear Programming
5.916	Engineering Analysis Utilizing Data Processing
5.941	Management Information Systems

Students must take sufficient electrical engineering departmental courses to total 30 of the 40 quarter hours required for the degree.

Thesis

A thesis carrying six credits may be elected with the approval of the chairman of the department. If the thesis option is approved, this work is done in the second half of the program.

THE DOCTOR'S DEGREE

Full-Time Program

The following material outlines the procedures for admission to the doctoral program and the steps necessary to qualify for the Ph.D. degree. For further information applicants should write to the Secretary, Department of Electrical Engineering.

Admission

Students who are interested in pursuing a doctor's program, should contact the Electrical Engineering Department to request an application. Completed applications, together with transcripts of all prior work and two letters of recommendation, should be forwarded to the Electrical Engineering Department, 412 Dana Hall, no later than 1 December of the preceding year. Following evaluation of this material, the applicant will be informed whether or not he will be permitted to undertake the qualifying examination. A personal interview is not required, but a student may arrange with the Secretary of the Electrical Engineering Graduate Committee, Professor Robert N. Martin (617-437-3041), for an appointment for further program details if desired. A student who has received approval to take the qualifying examination is considered a pre-doctoral student until such time as he passes the examination. Upon successful completion of the qualifying examination he becomes a Ph.D. candidate.

Residence Requirement

The residence requirement is satisfied by one year of full-time graduate work or two consecutive years of part-time graduate work. In the latter case, a detailed time schedule must be approved by the student's adviser in order to give evidence that at least half of the time is being devoted to the requirements of the graduate school program.

Qualifying Examination

The Ph.D. qualifying examination has emerged from its role as a requirement for admission to the doctoral program to the dual purpose of, one: serving as an indicator of the student's capability for successful completion of the program, and two: serving as a guide to his adviser in developing a suitable plan of study tailored to the individual needs of the candidate.

With these goals in mind, the candidate is urged to take the qualifying examination early in his graduate program (i.e., not later than the successful completion of 40 quarter hours of graduate work).

The examination is composed of a written and an oral part, and is usually given in the spring quarter of each academic year. The written part covers the following general categories:

- (1) Circuits and Electronics
- (2) Fields, Waves, and Energy Conversion
- (3) Systems
- (4) Miscellaneous Topics in Electrical Engineering

For candidates pursuing a Ph.D. with an emphasis in either Computer Science or Modern Optics, the qualifying examination will be appropriately modified.

The oral part is designed to test general comprehension. Together, the oral and written portions of the examination review the factual knowledge of a typical undergraduate Electrical Engineering program and the understanding of that material from a more mature point of view.

If the examination is failed it may be repeated only with permission of the Graduate Committee upon recommendation of the Ph.D. Qualifying Examination Committee.

Comprehensive Examination

Within three years of his establishment of degree candidacy, the student will be required to demonstrate by means of a comprehensive examination a subject matter knowledge satisfactory for the award of the degree.

The comprehensive examination is an oral examination open to the Electrical Engineering faculty (assistant professor and above in rank) and administered by the student's Thesis Committee. Departmental faculty will be informed of the examination via a departmental notice at least one week prior to the examination. Normally the examination will be given at the time the Thesis Proposal is submitted to the Thesis Committee for approval. As part of this examination the Thesis Committee will review the student's doctoral program and his performance in graduate courses, as well as examine the student on subject matter related to his graduate studies and his thesis area.

Course Requirements

Successful completion of a doctoral program normally requires 70 quarter hours of satisfactory graduate level work exclusive of thesis research and doctoral reading courses.

Doctoral Seminar, 3.993 and 3.994 are the only required courses.

The course work must include a three-course sequence (graduate level) in each of two minor areas. Both minors must be in science, applied science, or a related area. One minor may be chosen from an area of electrical engineering outside the candidate's proposed major area.

Thesis

The candidate's thesis research shall be directed by his Thesis Adviser, whom he shall select upon establishing candidacy. The Thesis Committee shall approve the thesis in final form.

Language Requirement

The language requirement may be satisfied in French, German, or Russian. The Princeton Educational Testing Service Language Examination is used for this purpose. The examination is administered by Northeastern University annually. If necessary, it may be taken at another institution. It must be passed before the final oral examination is taken.

Final Oral Examination

This examination will be held in accordance with the departmental regulations.

THE ELECTRICAL ENGINEER DEGREE

The Department of Electrical Engineering offers the graduate professional degree usually known as the Engineer Degree. This degree, offered at a number of institutions, usually requires about one year of full-time graduate study beyond the master's degree. The official title of the degree is "Electrical Engineer".

The following material outlines the procedures for admission to the Electrical Engineer degree program and the steps necessary to qualify for the degree. For further information applicants should write to Professor Robert A. Gonsalves, Department of Electrical Engineering, Room 329, Dana Hall, Northeastern University.

Admission

Students who are interested in pursuing the Electrical Engineer degree should make application for admission to the program prior to April 1. A master's degree in electrical engineering or its equivalent and the approval of the departmental graduate committee is required for admission. In some cases, where the master's degree is not in electrical engineering, a student may be admitted to the program with the stipulation that certain deficiencies be made up without credit toward the degree.

The Engineer Degree is available on either a full-time or part-time basis.

Classification and Degree Candidacy

A student admitted to the Engineer degree program will be designated as a candidate for this degree.

Residence Requirement

The residence requirement is satisfied by two academic quarters of full-time graduate work during the same academic year or four academic quarters of half-time graduate work during a period of two consecutive academic years. In the latter case, or if the student is in the part-time program, the plan for satisfying residence requirements must be approved by the student's adviser.

Qualification and Examinations

A student must maintain a B average in order to qualify for the degree. In some instances, a student may be required to take special examinations. Such examinations will be determined in each case by the departmental graduate committee.

Course Requirements

The minimum course requirements will be 40 quarter hours beyond the master's degree, with no more than 10 quarter hours of credit out of the 40 allowed for work on the dissertation. A minimum of 20 quarter hours must be taken in electrical engineering. The student's course program must be approved by his adviser.

Dissertation

Each engineer degree student must complete a dissertation which demonstrates a high level of competence in research, development, or design in the field of electrical engineering. As a general guideline, the amount of effort normally expected will be the equivalent of about 10 quarter hours of graduate work.

Language Requirement

No foreign language is required for the Electrical Engineer degree.

Final Oral Examination

A final oral examination consisting of a defense of the dissertation may be required if the student's adviser and the departmental graduate committee so decide.

Transfer of Credits

Approval for transfer of credit may be given by the departmental graduate committee upon request from the student.

Time Limitation

After admission to the program, a maximum of five years will be allowed for completion of the degree requirements. Extension of this time limit may be granted with the approval of the departmental graduate committee.

Registration

All students must register for course work or dissertation as approved by their advisers or the departmental registration officer. After the first registration for this work, registration must be continuous unless withdrawal is allowed by the departmental committee in charge of the degree program.

chemical engineering

Admission

To be enrolled for graduate work in Chemical Engineering, applicants must have obtained a Bachelor of Science degree in Chemical Engineering, with an acceptable quality of undergraduate work, from a recognized college or university.

THE MASTER'S DEGREE

Full-Time Program on the Cooperative Plan

Forty quarter hours of academic work are required. This program may be taken on the Cooperative Plan where students enroll for academic work in the Fall and Spring Quarters of the first year and in the Winter Quarter of the second year. The other three quarters of the two academic years and the summer after the first year are available for professional employment. Students who are admitted to a master's degree program under the Cooperative Plan must complete, through satisfactory performance, each cooperative work assignment in order to be eligible for their degree.

The sequence of courses on the Cooperative Plan will normally be taken according to the following pattern:

First Academic Quarter	Credits	Second Academic Quarter	Credits
4.802 Chemical Engineering		Chemical Engineering	
Mathematics	4	Electives	8
*4.829 Chemical Process		4.991 Thesis	5
Control	4		
4.891 Kinetics of Chemical Processes	4		
4.991 Thesis	2		
	<hr/> <hr/> 14		<hr/> <hr/> 13

Third Academic Quarter	Credits
Chemical Engineering	
Electives	8
4.991 Thesis	5
	<hr/> 13

* This course may be exchanged with a Spring Quarter elective during the 1973-74 academic year only.

Chemical Engineering Electives

The electives will normally be available according to the following schedule:

Winter Quarter	Spring Quarter
4.803 Numerical Techniques in Chemical Engineering	4.801 Advanced Chemical Engineering Calculations
4.811 Chemical Engineering Thermodynamics	4.806 Optimization Techniques
4.823 Transport Phenomena	4.845 Advanced Plant Design Concepts
4.840 Advanced Management Techniques in the Chemical Industry	4.850 Chemical Process Pollution Control (Water)
4.890 Chemical Reactor Analysis	4.973 Heat Transfer
4.974 Fluid Mechanics	

Additional course work may be substituted for the Master of Science thesis upon approval of the chairman of the department. The request for this substitution must be made at the time of acceptance to the graduate school.

Students may take the program on a continuous full-time basis to complete the degree requirements in one academic year. The sequence of courses which students take on this plan is established by the chairman of the department.

Electives

With the approval of the chairman of the department, substitutions may be made for some of the prescribed courses by other courses in the department or in other departments which give graduate work.

PART-TIME PROGRAM

The admission requirements for this program are the same as for the full-time program, but students may progress according to their ability to combine their study with their employment. Students must take sufficient day and evening chemical engineering courses so that the required courses in their major total at least 28 of the 40 quarter hours required for the degree. The remaining 12 credits may be elected from any approved courses in engineering or science for which the student has the necessary preparation. Required courses and electives for all degree candidates must be approved by the chemical engineering departmental adviser. A maximum of seven years is allowed to complete the program.

THE DOCTOR OF PHILOSOPHY DEGREE

The following material outlines the procedure for admission to the doctoral program and the steps necessary to qualify for the Ph.D. degree. For further information applicants should write to the Chairman of the Department of Chemical Engineering.

Admission

Applicants who are enrolled as candidates for the degree of Master of Science in Chemical Engineering at Northeastern University should apply in writing to the Chairman of the Department of Chemical Engineering for admission to the doctoral program. Such application must be made by April first of the year in which they expect to receive the master's degree. The departmental graduate committee will examine the record of the applicant and decide whether or not he should be allowed to take the qualifying examination.

Applicants who are enrolled for graduate work at other institutions or who have completed the requirements for the master's degree should write the chairman of the department for an application for an interview. This form, together with transcripts of all undergraduate and graduate work, must be transmitted to the chairman of the departmental graduate committee. The applicant will be notified of an interview time and, after the interview, will be advised if he should make formal application for admission to the doctoral program. Approved applicants must submit an application for admission as a doctoral candidate and two letters of recommendation not later than April first. The applicant will be notified of the acceptance of his application and the date of the qualifying examination.

Residence Requirement

The residence requirement is satisfied by one year of full-time graduate work or two consecutive years of part-time graduate work. In the latter case, a detailed time schedule must be approved by the departmental graduate committee as evidence that at least half of the time is being devoted to the requirements of the graduate school program. In general, it should be expected that at least two years of full-time work after establishment of degree candidacy will be necessary.

Degree Candidacy

Degree candidacy is established in accordance with the general graduate school regulations.

Qualifying Examination

The qualifying examination includes both written and oral parts and is normally given in the spring and the fall. The written examination, in general, will cover the following areas:

1. General Principles in Chemical Engineering Science
2. Thermodynamics and Stoichiometry
3. Mathematical Procedures and Kinetics
4. Specialized Technological Topics (to be announced)

The oral examination will test general comprehension.

A student may take any or all of the written examinations in each area and may repeat a failed examination, only once, at a later offering. The taking and successful completion of all examinations may not extend over a period greater than 13 months. Previously administered examinations will be available to formal applicants.

Comprehensive Examination

During the time in which a student is a candidate for a doctoral degree he may be required to demonstrate by means of a comprehensive examination a subject-matter knowledge satisfactory for the award of the degree.

Course Requirements

The course requirements in addition to the minimum requirements for establishing degree candidacy will be determined by the departmental graduate committee and the student in consultation with the committee.

Transfer credit will be dealt with on an individual basis by the departmental graduate committee in accordance with the general graduate school regulations.

Thesis

An individual may choose his thesis topic and supervisor as soon as he becomes a doctoral student. In most cases selection of topic will be made immediately after the student has established his candidacy for the Ph.D. degree. He will be expected to discuss with the staff their Ph.D. thesis topics offerings. After these discussions, the student shall notify the adviser, the department head, and the chairman of the departmental graduate committee in writing of his choice of thesis topic and adviser. The chairman of the departmental graduate committee after consultation with the thesis adviser shall appoint an appropriate thesis committee. This committee shall be kept informed of the progress of the thesis and will approve the thesis in its final form.

Language Requirement

The foreign language requirement may be satisfied by a reading knowledge in two languages selected from French, German, and Russian. The examinations are administered by the department and consist of translation from current scientific journals or textbooks.

Final Oral Examination

This examination is held in accordance with the general regulations of the graduate school.

THE DOCTOR OF ENGINEERING DEGREE

The following material outlines the procedure for admission to the doctoral program and the steps necessary to qualify for the Doctor of Engineering degree. For further information, applicants should write to the Chairman of the Department of Chemical Engineering.

Admission

Applicants for the Doctor of Engineering program must either be candidates for the Master of Science degree in Chemical Engineering or have completed the Master of Science program in Chemical Engineering.

Applicants need not have undertaken a master's thesis.

Applicants for the Doctor of Engineering degree must pass the doctorate qualifying examination given to applicants for the Doctor of Philosophy degree in this department.

Applicants must file application forms with the departmental graduate committee along with official transcripts of previous college work, and two letters of recommendation. Applicants will not be considered until all documents have been received. Applicants will be notified promptly as to whether or not they have been accepted.

Residence Requirement

The residence requirement is satisfied only by full-time residence for one academic year. This requirement must be fulfilled after successful completion of the qualifying examination and prior to the end of the five-year period set forth in the general regulations.

Degree Candidacy

Degree candidacy is established in accordance with the general graduate school regulations.

Qualifying Examination

The qualifying examination includes both written and oral parts and is normally given in the spring and the fall. The written examination, in general, will cover the following areas:

1. General Principles in Chemical Engineering Science
2. Thermodynamics and Stoichiometry
3. Mathematical Procedures and Kinetics
4. Specialized Technological Topics (to be announced)

The oral examination will test general comprehension.

A student may take any or all of the examinations in each area and may repeat a failed examination, only once, at a later offering. The

taking and successful completion of all examinations may not extend over a period greater than 13 months. Previously administered examinations will be available to formal applicants.

Comprehensive Examination

During the time in which a student is a candidate for a doctoral degree he may be required to demonstrate by means of a comprehensive examination a subject-matter knowledge satisfactory for the award of the degree.

Course Requirements

The course requirements, in addition to the minimum requirements for establishing degree candidacy, will be determined by the departmental graduate committee and the student in consultation with the committee.

Transfer credit will be dealt with on an individual basis by the departmental graduate committee in accordance with the general graduate school regulations.

Engineering Problem

Engineering Problem advisers will be appointed by the departmental graduate committee. Approval of the topic for the Problem rests with the Problem adviser and the committee.

The Engineering Problem is not a research problem but rather an engineering problem in depth. It may include elements of design, economics, business management principles, and process development. In general, it will not include laboratory investigations.

Normally, the Engineering Problem will be solved on campus. Under special arrangements approved by the departmental graduate committee and the adviser, a portion of the work may be performed off campus.

Regardless of the arrangements made for the Engineering Problem, no off-campus adviser will be approved. Only the Problem adviser will specify the nature and requirements of the Problem, and the findings and results remain the property of the adviser and the University to be published as they determine.

Language Requirement

There is no foreign language requirement for this degree.

Computer Ability

Ability with computer programming must be demonstrated when required.

Final Oral Examination

This examination is held in accordance with the general graduate school regulations.

industrial engineering and engineering management

The Department of Industrial Engineering offers two degrees: Master of Science in Industrial Engineering and Master of Science in Engineering Management. Either degree can be pursued on a part- or full-time basis and full-time students may elect to participate in the Cooperative Plan. Under the Cooperative Plan a student spends 9-12 months working in a field which is complementary to his academic program and professional goals. During this time he receives compensation from his employer, which is generally in line with salaries for engineers with equivalent experience.

The Master of Science in Industrial Engineering has a General Program as well as majors in Health Systems, Computer and Information Systems, and Operations Research; all of which require a thesis. The Master of Science in Engineering Management has a General Program and majors in Computer and Information Systems and Operations Research. A thesis is not a requirement for this degree. A minimum of 40 quarter hours of graduate level credit is required for either degree program.

Industrial Intern Program Leading to the MSIE

The Engineering Sponsorship program in Industrial Engineering is known as the Industrial Intern Program. The program, available to a selected group of students, is an enriched MSIE cooperative program in which the student, the University, and a cooperating employer tailor each program to individual interests. Usually the minimum academic requirements of the MSIE program will be substantially surpassed in the industrial intern option.

Through agreements with cooperating employers, students accepted for the industrial intern option will receive full tuition and living expenses for seven or eight quarters. Four of these will be spent in pro-

fessionally relevant employment. During each of these cooperative quarters, students will take independent study under the direction of a faculty member. Wherever possible, those specialized reading courses will lead toward a thesis problem statement of interest to the student, cooperative employer and the department. When this goal is achieved, the MSIE program will be completed in seven quarters. A goal of the industrial intern option is that each student's thesis be a significant independent investigation.

Admission

To be enrolled for graduate study in Industrial Engineering or Engineering Management, the applicant must have obtained a Bachelor of Science degree in an engineering field, with an acceptable quality of undergraduate work from a recognized college or university. A limited number of applicants with a Bachelor of Science degree in mathematics or a closely related science, whose preparation is considered adequate, may be permitted to pursue either program, and, upon its completion, qualify for the degree of Master of Science without specification.

Entrance to either program presupposes that students have had a basic course in each of the following areas: engineering economy, probability, engineering statistics, operations research (deterministic and stochastic), computer programming (compiler language), and accounting. Recognizing that some applicants may be deficient in certain of these subjects, the program offers the intensive courses listed below. At the time of admission to the program the adviser will specify, on the basis of the applicant's transcript, those courses on the list which the applicant must complete satisfactorily to qualify for the degree. Such specified courses are to be completed as early in the program as scheduling will permit. The courses below carry graduate credit but a maximum of six quarter hours of credit from this group may be used as elective credit toward the degree.

Course	Credits
5.808 Basic Engineering Economy	2
5.810 Industrial Accounting for Engineers	2
5.901 Basic Operations Research I (Deterministic)	2
5.902 Basic Operations Research II (Stochastic)	2
or	
5.900 Operations Research	4
Equivalent to 5.901 and 5.902	
5.913 Data Processing for Engineers (FORTRAN)	2
5.950 Engineering Statistics I or 10.8G1	2
5.951 Engineering Statistics II	2

Industrial Engineering Programs — no specified major**Required Courses**

Course		Credit	Quarter
5.803	Industrial Organizations	2	Fall
5.823	Advanced Production Analysis*	4	Fall
5.824	Case Studies in Industrial Engineering ..	2	Spring
5.909	System Engineering and Analysis	2	Spring
5.914	Advanced O.R.	4	Spring
5.992	Seminar	2	Fall
5.991	Thesis	6	All Quarters
10.592	Mathematical Statistics or 5.952 Design of Experiments I and 5.958 Design of Experiments II	4	

The remaining hours are satisfied through a suitable choice of electives at least 6 hours of which will come from one of the five areas of concentration:

- Management of Technology
- Operations Research and Quantitative Techniques
- Production Engineering and Man/Machine Systems
- Financial and Operational Controls
- Computer and Information Systems

HEALTH SYSTEMS MAJOR

This major is offered on a two-year cooperative basis. Students are expected to spend at least three academic quarters as an intern or resident in training in a health-oriented organization such as a hospital or health planning agency. In addition, the thesis topic must be related to the field of health.

Required Courses

Course		Credit	Quarter
5.823	Advanced Production Analysis*	4	Fall
5.860	Health Care Organization and Management	2	Fall
5.865	Case Studies in Health Systems	2	Spring
5.909	Systems Engineering and Analysis	2	Winter
5.914	Advanced O.R.	4	Spring
5.991	Thesis	6	All Quarters
5.992	Seminar	2	Fall
39.9H1	Economics of Health and Welfare	2	Winter

The remaining hours should be satisfied through appropriate choice of electives.

* Not required for students with a degree in Industrial Engineering

ENGINEERING MANAGEMENT
(No specified major)

To assure adequate preparation for management of technological activities, all students who do not elect the Computer Systems or Operations Research major must earn the minimum number of credits indicated in each of the five categories listed below:

Category	Minimum Credits
a. Management of Technology	8 including 5.801
b. Operations Research and Quantitative Techniques	8
c. Production Engineering	4
d. Financial and Operational Controls	4 including 5.830
e. Computer and Information Systems	4
<hr/>	
TOTAL	28

The remaining 12 quarter hours required for the degree may be considered as free electives. These may be taken within the course offering for this program or from any courses in graduate engineering and mathematics for which the student has adequate preparation. Up to six quarter hours may be elected in other graduate schools subject to the approval of the adviser for this program and the director of the graduate school in which the course is offered. Students desiring courses in such subjects as economics, business law, labor relations, or marketing, should consult the *Graduate School of Business Administration Catalog*.

Courses in the five categories from which students must select to meet the indicated minimum total of 28 quarter hours of credit are listed below. Unless otherwise specified, all courses are for two quarter hours of credit.

a. Management of Technology

- 5.801 & 5.802 Analysis of the Industrial Enterprise I and II
- 5.803 Industrial Organizations
- 5.812 Management of Technical Innovation
- 5.814 Development of Engineering Managers
- 5.815 Legal Aspects of New Technology
- 5.816 Industrial Psychology for Engineers
- 5.820 Personnel Administration for Engineers
- 5.823 Advanced Production Analysis (4 q.h.)
- 5.841 Engineering Project Administration

b. Operations Research & Quantitative Techniques

- 5.903 Inventory Control and Production Planning
- 5.904 Queuing Theory and Its Applications
- 5.905 Analysis with Simulation

5.909	Systems Engineering and Analysis
5.911	Linear Programming
5.912	Network Planning and Control
5.914	Advanced Operations Research (4 q.h.)
5.916	Engineering Analysis Utilizing Data Processing
5.952	Design of Experiments I
5.953	Statistical Decision Theory
5.954	Advanced Quality Control
5.955	Reliability and Maintainability Applications
5.956	Mathematical Theory of Reliability
5.957	Designing for Reliability
5.958	Design of Experiments II

c. Production Engineering and Man/Machine Systems

5.806	Production Forecasting
5.817	Advanced Work Design
5.819	Human Factors in Man/Machine Systems
5.822	Product Design and Value Analysis
5.823	Advanced Production Analysis (4 q.h.)
5.825	Topics in Production Engineering
5.903	Inventory Control and Production Planning
5.912	Network Planning and Control
5.954	Advanced Quality Control
5.955	Reliability and Maintainability Applications
5.956	Mathematical Theory of Reliability
5.957	Designing for Reliability

d. Financial and Operational Controls

5.805	Industrial Budgeting for Engineers
5.809	Advanced Engineering Economy
5.811	Cost Accounting for Engineers
5.830 & 5.831	Financial Management I and II
5.930	Basic Computer Systems Technology
5.940	Basic Information Systems Technology
5.941	Management Information Systems

e. Computer and Information Systems

5.905	Analysis with Simulation
5.916	Engineering Analysis Utilizing Data Processing
5.930	Basic Computer Systems Technology
5.931	Computer Systems
5.932	Advanced Computer Systems
5.940	Basic Information Systems Technology
5.941	Management Information Systems
5.942	Advanced Management Information Systems
5.943	Management Decision Systems
3.893	Digital Computer Programming I

3.894	Digital Computer Programming II
3.895	Digital Computer Programming III
3.972	Electronic Digital Computers I
3.973	Electronic Digital Computers II
3.974	Electronic Digital Computers III
3.985	Fundamentals of Automatic Digital Machines I
3.986	Fundamentals of Automatic Digital Machines II
3.987	Fundamentals of Automatic Digital Machines III
3.989	Computer Peripherals

COMPUTER AND INFORMATION SYSTEMS MAJOR

The Computer and Information Systems (C & IS) Major is designed to meet the needs of three distinct but related professional areas — computer systems, information systems, and management.

A unique two track curriculum offers sets of courses in computer systems and information systems, each track tailored for particular specialties but integrated with material from the other track for general management. The computer system track focuses on basic concepts and their implementation in hardware and software systems. The information systems track focuses on supporting the management decision process — evaluation, analysis, and design of management information and decision systems.

The number of courses required from each track depends upon the students professional objectives. Unique programs can be designed in consultation with the adviser. All C & IS majors will be expected to take the ten or sixteen quarter hours of courses listed below as general requirements. In addition they are required to take at least sixteen quarter hours from category (e), computer information systems. It is suggested that students within this major follow one of the two course tracks listed below as a portion of the sixteen quarter hour requirement. Exception to these regulations must be approved in a consultation with an adviser.

General Requirements

	Minimum Credits
Management of Technology;	
5.801 Analysis of the Ind. Enterprise I	2
Operation Research & Quantitative Techniques	
5.905 Analysis with Simulation	2
Elective within category	2
Production Engineering	
Elective within category	2
Financial Controls	
5.830 Financial Management I	2
Thesis	
5.991 (Required of Industrial Engineering majors) ..	6
	<hr/> 10 or 16

Two Track Course List**Computer Systems Track**

- 5.930 Basic Computer Systems
Technology
5.931 Computer Systems
5.932 Advanced Computer
Systems

Information Systems Track

- 5.940 Basic Information Systems
Technology
5.941 Management Information
Systems
5.942 Advanced Management
Information Systems
5.943 Management Decision
Systems

OPERATIONS RESEARCH MAJOR

The following courses are required of students electing the Operations Research major:

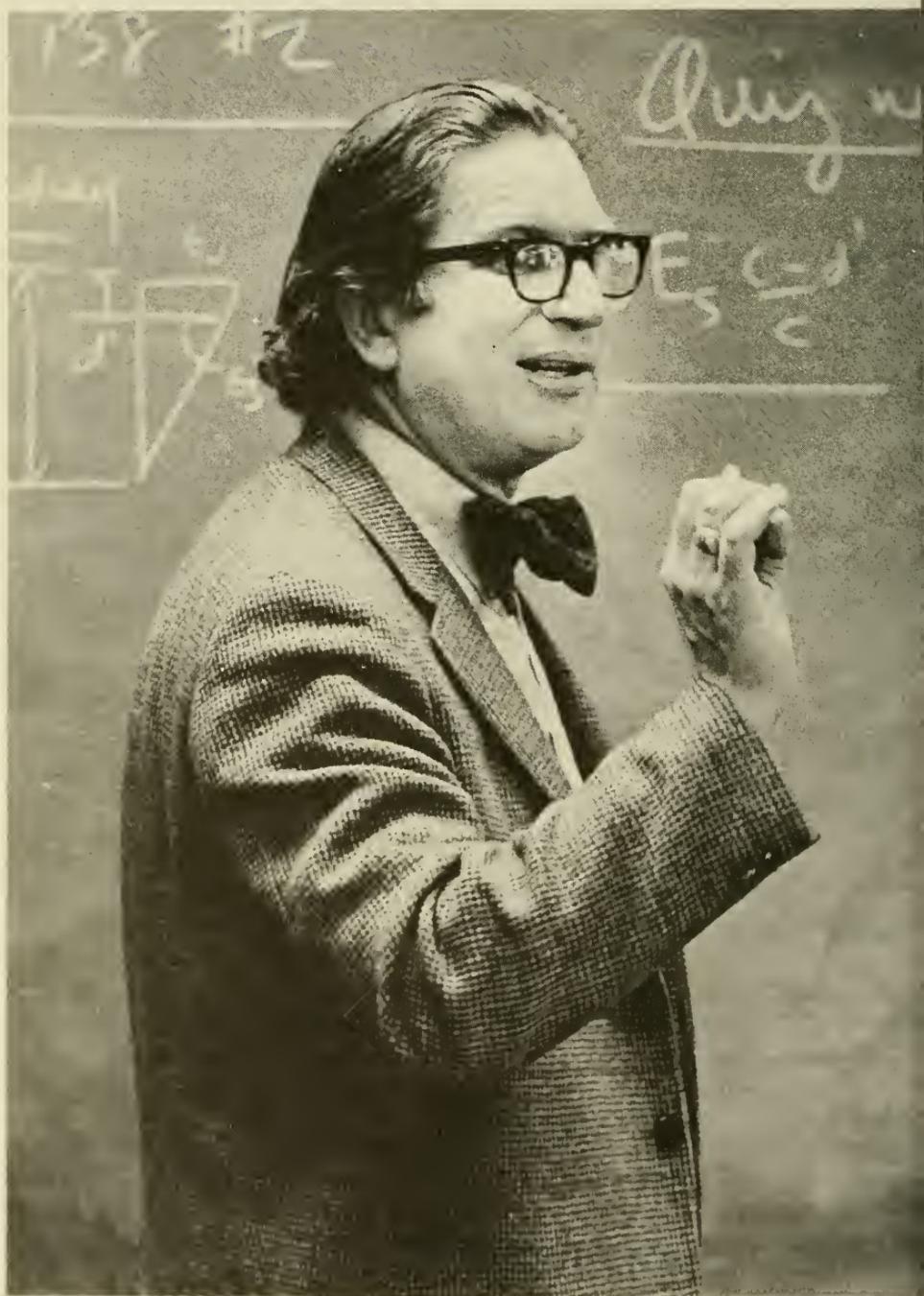
	Credits
*10.8G2 Probability II	2
5.801 Analyses of the Industrial Enterprise	2
5.830 Financial Management I	2
5.914 Advanced Operations Research	4
5.991 Thesis (required of Industrial Engineer majors) ..	6
	10 or 16

In addition to the above required courses, the student must earn the minimum number of credits in each of the categories listed below.

Category	Minimum Credits
b. Quantitative Techniques	8
c. Production Engineering	4
e. Computer Systems	4
Math-oriented courses (listed below)	4
5.910 Analytical Techniques for Engineers	
*10.8B4 Advanced Calculus I	
*10.8B5 Advanced Calculus II	
*10.8B6 Advanced Calculus III	
*10.8G8 Stochastic Processes I	
*10.8G8 Stochastic Processes II	

The remaining hours required for the degree may be considered as free electives. These may be taken within the course offerings for this program or from any courses in graduate engineering or mathematics for which the student has adequate preparation. Up to six quarter hours may be elected in other graduate schools subject to the approval of the adviser for this program and the director of the graduate school in which the course is offered. Students desiring courses in such subjects as economics, business law, labor relations, or marketing should consult the catalog of the Graduate School of Business Administration.

See Graduate School of Arts and Science Catalogue.



description of courses

All courses carry two quarter hours of credit unless otherwise noted. Not all courses are offered every year. Refer to the Graduate School of Engineering circular issued about July 1 each year for the courses to be offered in the new academic year and the times at which they are scheduled to meet.

CIVIL ENGINEERING

.206 Applied Probability Theory for Civil Engineers (4 q.h. credits)

The basic elements of probability theory and their use via the solution of various civil engineering problems encountered in fluid mechanics, construction management, structures, transportation, etc. Probability of events, random variables and distribution, derived distribution, expectation, and common probability models. *Prep. Admission to Graduate School of Engineering.*

.800 Systems Analysis (4 q.h. credits)

Systems Analysis involves the use of quantitative and economic techniques for allocation of resources in the planning and design of large physical systems as encountered in transportation and environmental engineering. Topics include the calculus method for constrained and unconstrained optimization problems, linear programming, dynamic programming, marginal analysis, sensitivity analysis and decision analysis for selection. Offered yearly, fall quarter, days

.803 Traffic Flow Theory I

Statistical methods in traffic flow theory; probability models, hypothesis testing and its use, queuing theory and simulation techniques. *Prep. 5.950, Engineering Statistics I or equivalent.* Offered 1975-76, fall quarter

.804 Traffic Flow Theory II

Deterministic methods in traffic flow theory; car following models; various methods of analogy, capacity and level of service. *Prep. 1.803, Traffic Flow Theory I.* Offered 1975-76, winter quarter

.805 Traffic Flow Theory (4 q.h. credits)

This course, offered days, embodies the material in 1.803 and 1.804, Traffic Flow Theory I and II. *Prep. 5.950, Engineering Statistics I or equivalent.* Offered yearly, winter quarter

.806 Urban Transportation Analysis (4 q.h. credits)

This course, offered days, embodies the material in 1.801 and 1.802, Urban Transportation Analysis I and II. *Prep. 5.910, Analytical Techniques for Engineers or equivalent.* Offered yearly, winter quarter

1.810 Systems Analysis I

Systems Analysis involves the use of quantitative and economic techniques for allocation of resources in planning and design of large physical systems as encountered in transportation, environmental, and structural engineering. Topics include calculus method for constrained and unconstrained optimization problems, marginal analysis, and linear programming. Offered 1975-76, fall quarter

1.812 Systems Analysis II

A continuation of 1.810 and includes the following topics: sensitivity analysis, dynamic programming, and decision analysis for selection. Prep. 1.810, *Systems Analysis I*. Offered 1975-76, winter quarter

1.819 Environmental Impacts of Urban Transportation (4 q.h. credits)

Examination of the human response to noise, water and air pollution; physical effects of pollution in relation to source-receptor configurations and urban scale meteorology; laboratory and field techniques used in measuring pollutant levels; government regulations and guidelines and their effect on urban transportation planning. Prep. *Admission to Graduate School of Engineering*. Offered 1974-75, fall quarter, days

1.820 Transportation Engineering (2 q.h. credits)

Description and evaluation of different modes of transportation existing and proposed; their performance and cost characteristics; design, performance, and selection criteria for vehicles and roadbeds. Prep. *Admission to Graduate School of Engineering*.

1.824 Civil Engineering Materials I (2 q.h. credits)

The behavior of civil engineering materials subjected to various loading and environmental conditions. Includes atomic structure and bonding, elastic and plastic behavior of metals, strength and durability of wood, concrete, and bituminous mixes.

1.825 Civil Engineering Materials II (2 q.h. credits)

Continuation of 1.824. Includes composite materials, phase transformations, corrosion, strengthening mechanisms.

1.834 Transportation Analysis and Planning (4 q.h. credits)

Principles of the analysis of transportation networks through the use of the conventional forecasting model system; evaluation of alternative transportation networks and their components; basic aspects of traffic analysis.

1.837 Interdisciplinary Urban Transportation Seminar

Review and presentation of research and public policy on broad topics in transportation. Guest lecturers and formal paper presentations. Prep. *Permission of Civil Engineering Department*. Offered 1974-75, spring quarter

1.838 Master's Report (Transportation) (4 q.h. credits)

An individual effort in an area selected by student and adviser resulting in a definitive report. Prep. *Permission of the Civil Engineering Department*.

Offered yearly, all quarters

1.839 Thesis (Master's Degree) (6 q.h. credits)

Analytical and/or experimental work conducted by arrangement with and under the supervision of the department. Prep. *Permission of the Civil Engineering Department*. Offered yearly, all quarters

.841 Structural Analysis I

Review of basic principles of structural analysis, determinacy, indeterminacy, stability. Introduction to energy methods including virtual work and Castigliano's Theorem. *Prep. Differential and Integral Calculus plus Theory of Structures.* Offered yearly, fall quarter

.842 Structural Analysis II

Contemporary methods of structural analysis with emphasis on lateral load analysis of multistory structures. A complete treatment of moment distribution including non-prismatic members, axial load, and shear distribution. *Prep. 1.841 Structural Analysis I.* Offered yearly, winter quarter

.843 Structural Analysis III

Introduction to matrix methods of structural analysis, including stiffness and flexibility methods. *Prep. 1.842, Structural Analysis II.*

Offered yearly, spring quarter

.844 Structural Analysis IV

Introduction to advanced structural mechanics, emphasis on theory of elasticity, and development of finite element method of analysis. *Prep. 1.843 Structural Analysis III.* Offered 1974-75, fall quarter

.847 Structural Analysis (4 q.h. credits)

This course, offered days, embodies the material in 1.841 and 1.842 — Structural Analysis I and II. *Prep. Differential and Integral Calculus plus Theory of Structures.* Offered yearly, fall quarter

.849 Model Analysis

Development of the principles of similitude to establish the relationship between behavior in the model and the full-sized structure. Review of techniques to fabricate, to load, and to instrument models. Application and use of strain gauges. The laboratory portion is devoted to model analysis of a complex structure. *Prep. Admission to program and approval of instructor.*

Offered 1975-76, spring quarter

.850 Structural Dynamics I

Analysis by exact and approximate methods of structures subjected to dynamic loads. *Prep. 1.843, Structural Analysis III.* Offered 1974-75, winter quarter

.851 Structural Dynamics II

Continuation of 1.850 with application to the analysis of structures subjected to blast loads and seismic loadings. *Prep. 1.850, Structural Dynamics I.*

Offered 1974-75, spring quarter

.853 Concrete Structures I

Review of basic characteristics of concrete. Structural forms appropriate for reinforced and prestressed concrete. Prestressed concrete design. *Prep. Reinforced Concrete Design and Structural Analysis.* Offered yearly, fall quarter

.854 Concrete Structures II

Continuation of Concrete I. Additional topics on prestressed concrete design, yield line theory, and folded plate design. *Prep. 1.853 Concrete Structures I.* Offered yearly, winter quarter

1.855 Concrete Structures III

Analysis and design of thin-shell concrete structures including domes, cylindrical shells, and hyperbolic paraboloids. *Prep. 1.854 Concrete Structures II.*

Offered yearly, spring quarter

1.856 Structural Analysis (4 q.h. credits)

This course, offered days, embodies the course content offered in 1.843, Structural Analysis III and 1.844, Structural Analysis IV. *Prep. 1.847, Structural Analysis.*

Offered yearly, spring quarter

1.857 Structural Dynamics (4 q.h. credits)

This course, offered days, embodies the material in 1.850 and 1.851 — Structural Dynamics I and II. *Prep. 1.856, Structural Analysis.*

Offered yearly, winter quarter

1.858 Concrete Structures (4 q.h. credits)

This course, offered days, embodies the material in 1.853 and 1.854 — Concrete Structures I and II. *Prep. Reinforced Concrete Design.*

Offered yearly, fall quarter

1.859 Structural Stability

Elastic and inelastic stability of structures including beams, columns, plates and shells. *Prep. 1.843, Structural Analysis III.* Offered 1974-75, fall quarter

1.861 Design of Structures I

An advanced course in elastic design in structural steel. Design problems involving braced and rigid frame structures subject to gravity, wind, and seismic loads are considered. *Prep. 1.842, Structural Analysis II.*

Offered 1975-76, fall quarter

1.862 Design of Structures II

An advanced course in analysis and design in structural steel with emphasis on plastic behavior including rigid frame buildings and braced multistory frame buildings. *Prep. 1.861, Design of Structures I.* Offered 1975-76, winter quarter

1.863 Design of Structures III

Advanced problems in elastic and plastic design of structural steel. Topics include curved girders and cable supported structures. *Prep. 1.862, Design of Structures II.*

Offered 1975-76, spring quarter

1.864 Design of Structures (4 q.h. credits)

This course, offered days, embodies the material in 1.862 and 1.863 — Design of Structures II and III. *Prep. 1.861, Design of Structures I.*

Offered yearly, winter quarter

1.871 Engineering Properties of Soils I

Review of phase relationships, soil consistency, etc.; permeability and capillarity; effective stress concept, analysis of seepage in porous media; stress distribution; introduction to settlement analysis. *Prep. Undergraduate course in basic soil mechanics.*

Offered yearly, fall quarter

1.872 Engineering Properties of Soils II

A continuation of course 1.871. The course covers consolidation theory and settlement analysis; shear strength properties of soils; stability analysis of open and braced cuts; and earth pressure theory and analysis. *Prep. 1.871 Engineering Properties of Soils I.*

Offered yearly, winter quarter

1.873 Soils Testing Laboratory

Emphasis on the soil behavior aspects of consolidation theory, settlement analysis, and shear strength. Approximately one-half of the term is devoted to laboratory studies in soil compaction, consolidation, and shear strength. *Prep. 1.871, Engineering Properties of Soils I.* Offered yearly, spring quarter

1.874 Soil Mechanics and Foundation Engineering I

Soil compressibility; case studies of deep-seated settlement; allowable settlements; preloading concepts; bearing capacity; subsurface exploration. *Prep. 1.872, Engineering Properties of Soils II.* Offered 1974-75, fall quarter

1.875 Soil Mechanics and Foundation Engineering II

Design principles of footings, mats and floating foundations; pile foundations; selection of foundation scheme; case studies. *Prep. 1.874, Soil Mechanics and Foundation Engineering I.* Offered 1974-75, winter quarter

1.876 Soil Mechanics and Foundation Engineering III

Lateral earth pressure theory; analysis and design of retaining walls, anchored bulkheads and braced cofferdams; dewatering; observational approach to design; foundation performance with case studies; cellular cofferdams. *Prep. 1.875, Soil Mechanics and Foundation Engineering II.* Offered 1974-75, spring quarter

.877 Engineering Properties of Soils (4 q.h. credits)

This course, offered days, embodies the material in 1.871 and 1.872 — Engineering Properties of Soils I and II. *Prep. Undergraduate course in basic soil mechanics.* Offered yearly, fall quarter

.878 Foundation Engineering (4 q.h. credits)

This course, offered days, embodies the course content offered in 1.874 and 1.875 — Soil Mechanics and Foundation Engineering I and II. *Prep. 1.877 Engineering Properties of Soils.* Offered yearly, spring quarter

.882 Engineering Geology I

Review of minerals, selected topics in historical and structural geology related to engineering geology; origin and occurrence of various rock types, geologic structures, faulting and joint systems; weathering of rock and weathering products, glaciation, geologic mapping and environmental aspects. *Prep. Undergraduate course in geology.* Offered 1975-76, fall quarter

.884 Rock Mechanics I

Interrelationship with other disciplines; index properties; classification systems; laboratory tests; state of stress and stress distribution. *Prep. 1.882, Engineering Geology I.* Offered 1975-76, winter quarter

.885 Rock Mechanics II

Behavior of rock under combined stresses; pore pressure effects; failure theories; in-site deformation modulus and shear strength characteristics; field testing. *Prep. 1.884, Rock Mechanics I.* Offered 1975-76, spring quarter

.892 Numerical Methods in Structural Mechanics I

Formulation and numerical solution of civil engineering problems in structural mechanics. Emphasis will be on lumped parameter systems. Equilibrium, eigenvalue, and propagation type problems will be covered. *Prep. 1.843, Structural Analysis III.* Offered 1974-75, winter quarter

1.893 Numerical Methods in Structural Mechanics II

Continuation of 1.892. *Prep. 1.892, Numerical Methods in Structural Mechanics I.* Offered 1974-75, spring quarter

1.894 Numerical Methods in Structural Mechanics (4 q.h. credits)

This course, offered days, embodies the material in 1.892 and 1.893 — Numerical Methods in Structural Mechanics I and II.

Offered yearly, spring quarter

1.897 Master's Report (Structural) (4 q.h. credits)

An individual effort consisting of laboratory and/or literature investigation and analysis or advanced design of a project in an area of structural engineering selected by student and adviser resulting in a definitive report. *Prep. Permission of the Civil Engineering Department.* Offered yearly, all quarters

1.898 Special Topics in Structural Engineering (2 q.h. credits)

An individual effort in an area selected by student and adviser resulting in a definitive report. Open to day students only. *Prep. Admission to Graduate School of Engineering.* Offered yearly, all quarters

1.899 Thesis (Master's Degree) (8 q.h. credits)

Analytical and/or experimental work conducted by arrangement with and under supervision of the department. *Prep. Permission of the department.*

Offered yearly, all quarters

1.901 Hydraulics I

Mechanical properties of fluids — fluid statics, continuity, energy relationships (Bernoulli and Euler equations), momentum, dimensional analysis, steady flow in conduits under pressure, pipe systems. *Prep. Undergraduate course in hydraulics.* Offered yearly, fall quarter

1.902 Hydraulics II

Open channel flow — energy relationships, critical flow, controls, momentum principles, flow resistance, uniform flow, gradually varied flow, local phenomena. *Prep. 1.901, Hydraulics I.* Offered yearly, winter quarter

1.903 Hydraulics III

Open channel flow — channel transitions; unsteady flow; potential flow — velocity potential function and stream function; selected topics in hydraulics and fluid mechanics. *Prep. 1.902, Hydraulics II.* Offered yearly, spring quarter

1.904 Hydraulics (4 q.h. credits)

This course, offered days, embodies substantially the material in 1.902 and 1.903 — Hydraulics II and III. *Prep. Undergraduate course in hydraulics.*

Offered yearly, winter quarter

1.905 Water Resources Planning I

Hydrologic cycle; precipitation studies including data adjustment, spatial and temporal variability, intensity-duration-frequency relationships; abstractions of water due to evapotranspiration and infiltration; groundwater flow, including flow nets and well hydraulics; runoff studies including data adjustment, runoff volume, peak flows, unit hydrographs, flood formulas, and drainage design. *Prep. Admission to Graduate School of Engineering.* Offered yearly, fall quarter

.906 Water Resources Planning II

Drainage and river basin morphology; hydrogeology; streamflow and streamflow routing; storage models of runoff; reservoir routing and design; floods and flood control; case studies in hydrology; water resources planning including water law and policy, urbanization and its effects, reservoir system operation and regulation, alternative uses of water resources, and multipurpose projects; conservation and reuse of water. *Prep. 1.905, Water Resources Planning I.*

Offered yearly, winter quarter

.907 Water Resources Planning III

Statistical studies applied to hydrologic data, including basic statistics; frequency and probability distributions; methods of frequency analysis; multiple linear regression and correlation analysis; introduction to mathematical modeling of hydrologic processes including discussion of deterministic and stochastic processes; time series analysis, Markov chains; synthetic hydrology and simulation. *Prep. 1.906, Water Resources Planning II.*

Offered yearly, spring quarter

.910 Water and Wastewater Treatment I

Water quality, water impurities and effects, the theory and practice of water treatment, and the elements of design of water treatment works including intake facilities, wells, filtration, coagulation, sedimentation, softening, iron and manganese removal, disinfection, and fluoridation. *Prep. 1.921, Environmental Chemistry II, or equivalent.*

Offered yearly, fall quarter

.911 Water and Wastewater Treatment II

Waste characteristics, the theory and practice of wastewater treatment and disposal, and the elements of design of primary and secondary treatment works, including screening, grit removal, sedimentation, biological treatment processes, sludge digestion and disposal, stabilization ponds, and disinfection. *Prep. 1.910, Water and Wastewater Treatment I.*

Offered yearly, winter quarter

.912 Water and Wastewater Treatment III

Water conversion, advanced wastewater treatment, and other special problems in water and wastewater characteristics and treatment, including corrosion control, pumping and storage, application of chemicals, radioactive wastes, thermal pollution, and treatment plant instrumentation. *Prep. 1.911, Water and Wastewater Treatment II.*

Offered yearly, spring quarter

Offered yearly, winter quarter, days

.913 Industrial Waste Disposal

Evaluation of industrial waste problems and development of process design for the required treatment facilities; study of various manufacturing processes and their wastewater problems; industrial waste survey techniques; characteristics of industrial wastes; waste reduction methods; physical, chemical, biological, and advanced treatment methods; industrial wastewaters and disposal and treatment of industrial solids and liquids. *Prep. 1.912, Water and Wastewater Treatment III and 1.921, Environmental Chemistry II.* Offered yearly, fall quarter

.914 Water & Wastewater Treatment (4 q.h. credits)

This course, offered days, embodies the material in 1.910 and 1.911 — Water and Wastewater Treatment I and II. *Prep. Two undergraduate semesters of hydraulics.*

Offered yearly, fall quarter

1.920 Environmental Chemistry I

Analytical chemistry principles are studied with reference to environmental engineering applications. The chemistry of processes such as coagulation, iron and manganese removal, ion exchange, softening, and disinfection are included. The principles of spectroscopy and polarography are also discussed. *Prep. Two semesters of general chemistry.*

Offered yearly, fall quarter

1.921 Environmental Chemistry II

A continuation of 1.920 including gas transfer, oxidation and reduction, and radiation chemistry. Reaction rates with reference to environment engineering applications such as BOD are discussed. Topics in organic chemistry and instrumental analysis are included. *Prep. 1.920, Environmental Chemistry I.*

Offered yearly, winter quarter

See NOTE below regarding courses 1.921, 1.922, and courses 1.930, 1.931.

1.922 Environmental Bacteriology

A study of bacteriology with emphasis on environmental engineering applications. The course includes cell structure, nutrition, morphology, growth, reproduction, and metabolism of bacteria. Effects of environmental factors including inhibition, killing, and natural habitats are discussed. Methods of quantitative bacteriology are also covered. *Prep. 1.921, Environmental Chemistry II.*

Offered yearly, spring quarter

1.923 Environmental Chemistry (4 q.h. credits)

This course, offered days, embodies the material in 1.920 and 1.921 — Environmental Chemistry I and II. *Prep. Two semesters of general chemistry.*

Offered yearly, fall quarter

1.930 Environmental Analysis I

A laboratory course for the analytical measurement of environmental conditions. Physical, chemical, and biological characteristics are determined by the latest analytical methods with emphasis on their fundamental principles and operational techniques. Interpretation of analytical results for practical applications is also stressed. *Prep. 1.921, Environmental Chemistry II.*

Offered yearly, winter quarter

NOTE: It is strongly recommended that this course and 1.931 be taken simultaneously with 1.921 and 1.922.

1.931 Environmental Analysis II

The laboratory analyses are continued with emphasis on the chemical and biological analyses associated with treatment methods; microbiological techniques utilizing microscopy and membrane filter preparation; emphasis on environmental reports. *Prep. 1.930, Environmental Analysis I.*

Offered yearly, spring quarter

1.933 Environmental Analysis (4 q.h. credits)

This course, offered days, embodies the material in 1.930 and 1.931 — Environmental Analysis I and II. *Prep. 1.923, Environmental Chemistry taken simultaneously.*

Offered yearly, fall quarter

1.935 Unit Operations in Environmental Engineering I

Laboratory scale unit operations illustrating the physical, chemical and biological principles involved in water and wastewater treatment. The aim is to obtain criteria for system design. Topics include disinfection, water softening, sedimentation, chemical coagulation, and ion exchange. *Prep. 1.931, Environmental Analysis II.*

Offered yearly, winter quarter

1.936 Unit Operations in Environmental Engineering II

A continuation of 1.935. Topics include biodegradability studies using the Warburg respirometer, activated sludge, anaerobic digestion, vacuum filtration, and chemical-physical process involved in wastewater treatment. A comprehensive evaluation of each unit process is required in a report from each student. *Prep. 1.935, Unit Operations in Environmental Engineering I.*

Offered yearly, spring quarter

1.938 Unit Operations in Environmental Engineering (4 q.h. credits)

This course, offered days, embodies the material in 1.935 and 1.936—Unit Operations in Environmental Engineering. *Prep. 1.933, Environmental Analysis and 1.913, Industrial Waste Disposal.*

Offered yearly, spring quarter

1.940 Public Health Engineering Survey

An historical survey of public health conditions to introduce the student to the modern approach to public health engineering problems. Applications of engineering principles to such problems as garbage and refuse disposal, control of insect-borne diseases, milk and food sanitation, rodent control, camp and recreational sanitation, housing, control of atmospheric pollution, and radiological health. *Prep. Admission to Graduate School of Engineering.*

Offered 1975-76, fall quarter

1.945 Solid Waste Management

Basic solid waste management for engineering and science students covering storage, collection practices, sanitary landfill principles, incineration practices and reclamation possibilities. *Prep. Admission to Graduate School of Engineering.*

Offered yearly, fall quarter

1.946 Waste Reclamation

Review and analyses of various unit operations useful or potentially useful in the separation and processing of salvageable materials from municipal refuse and incinerator residue; economics, management and regulatory practices affecting recovery and recycle possibilities. *Prep. 1.945, Solid Waste Management.*

Offered 1974-75 or by special arrangement, winter quarter

1.947 Incineration

Incinerator design and operation examining the combustion process, design problems and solutions, special incinerators for salvage and industrial operations, performance testing, and pollution control requirements. *Prep. 1.945, Solid Waste Management.*

Offered 1974-75 or by special arrangement, spring quarter

1.948 Solid Waste Laboratory

A laboratory and design course, offered to day students, covering practices related to the physical, chemical, and biological analysis of refuse, residue,

quench waters, and leachate. Field studies involving current local problems. Students will design systems to solve the problems. *Prep. 1.945, Solid Waste Management.*

Offered by special arrangement

1.950 Air Pollution Engineering

Theory and practice related to engineering management of air resources; applications of models for the atmospheric dispersion of pollutants; analysis of control systems for gaseous and particulate emissions utilizing dry collection, wet collection, absorption, and catalytic processes. Discussion of source control evaluation and air quality standards. *1.957. Prep. Admission to Graduate School of Engineering.*

Offered yearly, fall quarter

1.951 Radiological Health Engineering

Types and sources of radioactive wastes, methods of handling, storage, and disposition of solid, liquid, and gaseous radioactive wastes. Regulatory agency requirements. *Prep. Admission to Graduate School of Engineering.*

Offered 1975-76, winter quarter

1.952 Industrial Hygiene

Characterization and control of industrial problems associated with noise, heat and ventilation. Physical and biological aspects of environmental stress are discussed. Emphasis is placed on the application of engineering principles to the design of control systems. Evaluation procedures for control effectiveness are reviewed. *Prep. Admission to Graduate School of Engineering.*

Offered yearly, spring quarter

1.953 Environmental Microbiology

An advanced course in environmental microbiology. Transformations of environmental products containing compounds of sulfur, nitrogen, complex hydrocarbons and pesticides. Advanced techniques for the simulation and evaluation of microbiological systems applied to biological control of water and wastewater. *Prep. 1.922, Environmental Bacteriology.*

Offered yearly, spring quarter

1.954 Stream Sanitation

Analysis of the disposal of conservative and non-conservative pollutants in streams. Topics include water quality standards, BOD and oxygen relationships in streams, bacterial pollution, eutrophication, thermal pollution, and general corrective control methods in streams. *Prep. 1.920, Environmental Chemistry I.*

Offered yearly, spring quarter, evenings

Offered yearly, fall quarter, days

1.955 Air Sampling and Analysis

A laboratory course on air pollution measurements utilizing physical, chemical, and instrumental methods and calibration and use of sampling equipment for gaseous and particulate pollutants. Identification and quantitative measurements of pollutants are performed utilizing microscopy, spectrophotometry, gas chromatography, and atomic absorption spectroscopy. *Prep. 1.950, Air Pollution.*

Offered yearly, spring quarter

1.956 Air Pollution Control (4 q.h. credits)

This course, offered days, embodies the material of 1.950, Air Pollution Engineering and 1.955, Air Sampling and Analysis. *Prep. Admission to Graduate School of Engineering.*

Offered yearly, winter quarter

1.957 Air Pollution Science

Biological and chemical aspects of air pollution with emphasis on the toxicological aspects of the environment, physiological effects of aerosols, analysis of organic and inorganic constituents of the atmosphere and rationale for establishment of air quality criteria and standards. Note: Course 1.957 is open to non-engineering graduate students as well as engineering graduate students. *Prep. Consent of the department and instructor.* Offered yearly, winter quarter

1.960 Hydraulic Structures I

Dams and associated structures. Design criteria and preliminary analyses for gravity, arch, buttress, rock-fill and earth-fill dams. Foundation treatment and scour protection. Spillway structures. Gates. Navigation requirements of large rivers. Fishways. *Prep. Undergraduate course in hydraulics.*

Offered yearly, fall quarter

1.961 Hydraulic Structures II

Intake structures in reservoirs and on rivers. Tunnels and pipe lines: design criteria and structural analyses; economic studies for diameter selection. Penstocks and anchor blocks. Canals—seepage and erosion, linings, canal structures. *Prep. Undergraduate course in hydraulics.*

Offered yearly, winter quarter

1.962 Hydraulic Structures III

Surge tanks: selection of type. River regulation: design principles, flood protection and navigation requirements, bank revetments, groins, dikes, and levees. Cofferdams. Operation and maintenance of hydraulic structures. *Prep. Undergraduate course in hydraulics.*

Offered yearly, spring quarter

1.970 Design of Environmental Systems (4 q.h. credits)

The development of comprehensive engineering reports. Fundamental design concepts of complete systems for environmental control, including water treatment; wastewater disposal, air quality control, and solid waste disposal; evaluation of economic alternatives for environmental quality control; discussion of actual engineering reports and designs will include considerations of the logic and conclusions. *Prep. 1.912, Water and Wastewater Treatment III.*

Offered yearly, spring quarter, days

1.980 Environmental Planning and Control

Examination of the social, technological, economic, political, legal and institutional aspects of environmental planning and management; environmental impact and assessment considerations related to development projects; environmental planning methodology and techniques. *Prep. Admission to the Graduate School of Engineering.*

Offered 1974-75, fall quarter

1.985 Environmental Protection

Environmental quality and its effects on health, comfort, aesthetics, balance of ecosystems and renewable resources; interaction of the water-land-air complex, vector control, food protection, ionizing radiation, other radiation, and the energies of heat and sound. *Prep. Admission to the Graduate School of Engineering.*

Offered yearly, winter quarter

1.991 Thesis (Master's Degree) (8 q.h. credits)

Analytical and/or experimental work conducted by arrangement with and under

the supervision of the department. *Prep. Permission of the Civil Engineering Department.* Offered yearly, all quarters

1.992 Special Topics in Environmental Engineering (2 q.h. credits)

An individual effort in an area selected by student and adviser resulting in a definitive report. *Prep. Permission of the Civil Engineering Department.*

Offered yearly, all quarters

1.993 Master's Report Environmental Engineering (4 q.h. credits)

An individual effort consisting of laboratory and/or literature investigation and analysis or advanced design of a project in an area of environmental engineering selected by student and adviser resulting in a definitive report. *Prep. Permission of the Civil Engineering Department.* Offered yearly, all quarters

1.994 Seminar — Environmental Engineering

Discussions by professional engineers and scientists, faculty, and graduate students on subjects in the area of environmental engineering and science. Open to day students only. *Prep. Consent of the instructor.*

Offered yearly, winter quarter

1.996 Seminar — Environmental Health

Discussion by professional people in the public health field, faculty, and graduate students on subjects within the area of environmental health. Open to day students only. *Prep. Consent of the instructor.* Offered yearly, spring quarter

1.997 Thesis (Ph.D. Degree)

Open to day students only. *Prep. Admission to doctoral program in Environmental Engineering.* Offered yearly, all quarters

MECHANICAL ENGINEERING

The courses listed below are of an advanced undergraduate — first year graduate level. A maximum of eight (8) quarter hours of credit from this group of courses may be applied toward the master's degree.

Course	Credits
2.214 Experimental Stress Analysis	4
2.232 Engineering Materials	4
2.233 Thermodynamics of Propulsion	4
2.235 Statistical Thermodynamics	4
2.236 Nuclear Engineering I	4
2.237 Nuclear Engineering II	4
2.258 Gas Dynamics	4
2.260 Heat and Mass Transfer	4
2.270 Dynamics	4
2.817 Strain Gage Techniques	2
2.818 Photoelasticity	2
2.847 Dynamics I	2
2.848 Dynamics II	2

The following undergraduate courses which are given in the daytime, may be elected by graduate students for graduate credit subject to the credit hour restrictions listed above.

.214 Experimental Stress Analysis (4 q.h. credits)

Embodyes the material in 2.817, Strain Gauge Techniques and 2.818, Photoelasticity. *Prep. Admission to the Graduate School of Engineering.*

Offered 1974-75, spring quarter

.232 Engineering Materials (4 q.h. credits)

Covers thermodynamics of materials; phase equilibria ternary systems; reactions with environment, i.e. kinetics, oxidation, corrosion, etc.; materials design criteria and materials engineering case studies. *Prep. Admission to the Graduate School of Engineering.*

Offered spring quarter

.233 Thermodynamics of Propulsion (4 q.h. credits)

Application of the physical principles of thermodynamics, fluid mechanics and plasmas to the prediction of the behavior of propulsion devices; airbreathing engines and rocket engines with applications to show how physical laws describe and limit performance of particular devices; introduction to plasmas; fundamentals of electrical rocket engines. *Prep. Admission to the Graduate School of Engineering.*

Offered 1974-75 fall and winter quarters

.235 Statistical Thermodynamics (4 q.h. credits)

Statistical thermodynamics approaches the study of thermodynamic equilibrium regarding a system as a collection of particles to which the principles of either classical or quantum mechanics are presumed to apply; the statistical hypotheses of Boltzmann, Bose-Einstein, and Fermi-Dirac with emphasis on the properties of assemblies of independent particles; applications will be made to the study of gaseous systems, the Einstein and Debye theories of the specific heats of solids and the electron gas in a metal. *Prep. Admission to the Graduate School of Engineering.*

Offered 1974-75, spring quarter

.236 Nuclear Engineering I (4 q.h. credits)

Study of Nuclear Physics emphasizing atomic and nuclear structure, radioactive decay, and nuclear reactions with particular attention to fusion and fission; health physics, nuclear instrumentation, and the production and uses of radioactive isotopes; comparison of thermal, fast, and breeder reactor types; discussion of neutron interactions and slowing down; four-factor formula and the diffusion equation developed and applied to one-group theory for bare and reflected thermal reactors; energy production and distribution within the core; flux shaping. Not open to students who have completed 2.942, 2.943, and 2.944. *Prep. Admission to the Graduate School of Engineering.*

Offered fall and winter quarters

.237 Nuclear Engineering II (4 q.h. credits)

Development of two-group theory for thermal reactors; the physics and safety of fast reactors; effect of reactivity change, either intentional or accidental, changes due to temperature; fission product buildup, xenon buildup after shutdown, and fuel depletion; reactor design considerations including the interrelationship of reactor physics, reactor engineering (physical design heat transfer, etc.), reactor materials and economics; control and distribution of power; fuel cycle management. Not offered to students who have completed 2.942, 2.943, and 2.944. *Prep. Admission to the Graduate School of Engineering.* Offered spring quarter

2.258 Gas Dynamics

This course continues the study of fluid mechanics with emphasis on compressibility phenomena. The concept of sound speed is introduced and attention is devoted to one-dimensional steady flows. The effects of area change, friction, and heat transfer are considered, including the study of normal shock waves and the behavior of nozzles and diffusers. *Prep. Admission to the Graduate School of Engineering.* Offered 1975-76, spring quarter

2.260 Heat and Mass Transfer (4 q.h. credits)

Review of heat, mass, and momentum transfer analogies; rate equations; conduction problems in steady-state and transient-state for both heat and mass transfer with various constant and fluctuating boundary conditions in rectangular, cylindrical, and spherical coordinates solved by formal mathematics, difference (relaxation) techniques and methods of analogy; thermal stresses induced by non-uniform temperature distributions; heat transfer at high velocity and in rarefied gases; boiling heat transfer at temperature extremes, with forced and natural convection; phase change in bulk stagnant systems. *Prep. Admission to the Graduate School of Engineering.* Offered fall and winter quarters

2.270 Dynamics (4 q.h. credits)

Embodies the material in 2.847 and 2.848 — Dynamics I and II. *Prep. Admission to the Graduate School of Engineering.* Offered summer quarter

The following are graduate courses which carry two quarter hours of credit unless otherwise noted. Courses carrying four quarter hours of credit are day courses. Seminar and thesis may have varying credits established by the department at the time of registration. Not all courses are offered every year. Refer to the Graduate School of Engineering circular issued about July 1 each year for the courses to be offered in the new academic year and the times at which they are scheduled to meet.

2.804 Theory of Elasticity

Algebra and Calculus of Cartesian tensors relation to vector analysis; stress in a continuum, strain and strain rate in a continuum; governing equations for an elastic solid. *Prep. Admission to the Graduate School of Engineering.* Offered fall quarter

2.805 Theory of Elasticity

Stress and deformation analysis of elastic solids. Two-dimensional problems; stress concentration; thermal stress. Theory of torsion, prismatic and axial symmetric bars. Introduction to the theory of plates, bending of thin plates. *Prep. 2.802, Continuum Mechanics or 2.804, Theory of Elasticity.* Offered winter quarter

2.806 Theory of Elasticity

Method of finite differences. Numerical solutions; torsion problem; plate bending. Variational method and energy principles; minimum potential and complementary energy theorems. Introduction to dynamics of elastic solids; waves, vibrations. *Prep. 2.805, Theory of Elasticity.* Offered spring quarter

2.809 Plasticity and Creep

Types of deformation, elasticity, plasticity, creep, mechanical equation of state, plastic flow under multi-axial stress, and elastic creep. Relationship of com-

paratively simple laboratory material tests to more complex service conditions will be emphasized. *Prep.* A recent introductory materials course.

Offered 1974-75, spring quarter

2.810 Advanced Mechanics of Materials I

Review of fundamental stress concepts; point stress and strain; differential equations of stress; elastic properties; theories of failure; transverse bending; shear stress distribution; shear center; bending stresses due to non-symmetrical bending. *Prep.* Admission to the Graduate School of Engineering.

Offered fall quarter

2.811 Advanced Mechanics of Materials II

Thick and thin cylinders under elastic and plastic deformation; analysis of statistically indeterminate beams and frames by slope, deflection, and moment distribution techniques; stresses in curved beams, beams on elastic foundations. *Prep.* 2.810, Advanced Mechanics of Materials I.

Offered winter quarter

2.813 Advanced Mechanics of Materials III

Bending of flat plates; stability analysis of structural members; grid systems and other special topics to be selected by needs of the class. *Prep.* 2.811, Advanced Mechanics of Materials II.

Offered 1975-76, spring quarter

2.815 Plates and Shells

Bending of plates with various shapes, loads, and supports. Large deflection of plates. Membrane theory of shells. Analysis of cylindrical shells. General theory of thin elastic shells. Shells of revolution. *Prep.* 2.806, Theory of Elasticity.

Offered 1974-75, spring quarter

2.817 Strain Gauge Techniques

Theory and application of mechanical and electrical strain gauges. Installation, instrumentation, and circuitry of gauge set-ups for transducer use and experimental stress analysis. Use of brittle coatings in experimental stress analysis. *Prep.* Admission to Graduate School of Engineering. See course 2.214.

Not offered 1974-76

2.818 Photoelasticity

Theory and practice of photoelastic methods as applied to classical experimental stress analysis of models and as modified for use in photoelastic coatings. *Prep.* Admission to Graduate School of Engineering. See course 2.214.

Not offered 1974-76

2.819 Fluid Dynamics I

Discussion of a number of kinematic concepts important in the area of fluid dynamics; deformation rate, vorticity, the equation of continuity; a description of the state of stress in a fluid; derivation of the Navier-Stokes equation and the energy equation; appropriate boundary conditions will be considered; some study of surface-tension phenomena. *Prep.* Admission to the Graduate School of Engineering.

Offered fall quarter

2.820 Fluid Dynamics II

Study of viscous fluids of uniform, constant density; exact solutions of the governing equations; a study of two classes of flow, each of which is well-described by an approximate theory: the first is Stokes, or creeping flow, the relevant approximations being suitable for low Reynolds number, the second approximation is that formulated in boundary layer theory and valid at high

Reynolds number. In connection with the latter, suitable computation schemes for two-dimensional, steady, laminar boundary layers are presented. *Prep. 2.819, Fluid Dynamics I.*

Offered winter quarter

2.821 Fluid Dynamics III

Emphasis on the study of flows in which viscosity may be neglected as a suitable approximation; two-dimensional potential flows using the theory of complex variables; streaming flows past cylinders and airfoils; other topics include: the irrotational flow due to a waving rigid body, wave propagation at an interface, and inviscid fluid motions possessing vorticity. *Prep. 2.820, Fluid Dynamics II.*

Offered spring quarter

2.823 Advanced Gas Dynamics

The consequences of fluid compressibility are studied. Shock waves and the theory of characteristics are discussed with specific consideration given to two-dimensional steady flows and one-dimensional unsteady flows. *Prep. 2.820 Fluid Dynamics.*

Offered 1975-76, fall quarter

2.824 Advanced Gas Dynamics

This course continues the subject matter of 2.823. Additional topics may include axially-symmetric steady flow, small-perturbation theory, similarity rules, the hodograph method, or some aspects of physical acoustics. *Prep. 2.823 Advanced Gas Dynamics.*

Offered 1975-76, winter quarter

2.826 Math. Methods for Mechanical Engineers I

Bessel and Legendre functions; boundary-value problems and series of orthogonal functions. Partial differential equations and applications to heat transfer fluid flow, vibrations and wave propagation. *Prep. Admission to Graduate School of Engineering.*

Offered fall & winter quarters

2.827 Math. Methods for Mechanical Engineers II

Functions of a complex variable; Laurent series and singularities; residues and contour integration; conformal mapping and application; introduction to complex transforms. *Prep. Admission to Graduate School of Engineering.*

Offered fall, winter, spring quarters

2.828 Math. Methods for Mechanical Engineers III (Prerequisite: 2.826, 2.827)

Topics selected from various areas of engineering analysis; analytic approximation techniques; asymptotic and singular perturbation methods; integral transforms; variational formulations.

Offered 1974-75, spring quarter

2.838 Engineering Fracture Mechanics I

Fundamentals of brittle fracture; theoretical strength, micro/macro fracture characteristic, Inglis-Griffith theory, applicability of same. Linear elastic fracture mechanics; Orewan/Irwin extension to metals, effective surface tension and relation to fracture toughness, plastic zone size correction; geometry effects on fracture toughness; plane strain/plane stress fracture toughness, thickness effects. *Prep. Admission to the Graduate School of Engineering.*

Offered fall quarter

2.839 Engineering Fracture Mechanics II

Experimental determination of fracture toughness; slow crack growth "pop-in", arrest, R-G curves, compliance techniques for determining elastic energy

release note. Alternate fracture toughness concepts; resistance curve, crack opening displacement, the J integral. Application of fracture mechanics to fatigue. Design methods to minimize risks of catastrophic failure will be emphasized. *Prep. 2.838, Engineering Fracture Mechanics I.* Offered winter quarter

2.840 Finite Element Analysis Methods

Introduction to the finite element method of numerical analysis; applications in solid mechanics include direct methods, energy approaches and weighted residuals; formulation of simple element stiffness matrices and assembly in one and two dimensions; solids of revolution; brief discussion of complex elements used in large computer programs. Various examples of existing programs to be taken from statics, dynamics, plasticity and heat transfer. *Prep. 2.802, Continuum Mechanics or permission of instructor.* Offered spring quarter

2.841 Vibration Theory and Applications

Modeling of vibratory systems; one degree of freedom systems (determination of equations of motion using free-body and energy methods); forced and free vibrations through two degrees of freedom; Laplace transformation techniques; phase-plane diagrams for undamped forced vibrations and Coulomb damping. *Prep. Admission to the Graduate School of Engineering.* Offered fall quarter

2.842 Vibration Theory and Applications

Multiple degrees of freedom; free and forced vibrations with or without damping, extensional and torsional oscillation, frequency equation, energy methods of solution. *Prep. 2.841, Vibration Theory and Applications or 2.861, Systems Engineering.* Offered winter quarter

2.843 Vibration Theory and Applications

Systems with distributed mass and stiffness; shock and impact; vibrations of beams and related structures; nonlinear and random vibrations. *Prep. 2.842, Vibration Theory and Applications.* Offered spring quarter

2.845 Shock, Vibration, and Noise Control

Theoretical and practical considerations pertinent to the design and protection of structures and equipment subject to severe environments of transient shock, steady state vibration, random vibration, and acoustic noise. *Prep. 2.843, Vibration Theory and Applications.* Offered 1975-76, spring quarter

2.846 Non-Linear Vibrations

Studies of various non-linear problems and the techniques used in solving them. Symmetrical and unsymmetrical systems. The Van der Pol-Kryloff-Bogoliuboff method as well as others will be discussed. *Prep. 2.843, Vibration Theory and Applications.* Offered 1974-75, spring quarter

2.847 Dynamics I

Application of fundamental laws of motion. Transformations of coordinate systems, kinematics of a particle using translating or rotating axis, LaGrange equations, space dynamics. *Prep. Admission to the Graduate School of Engineering.* See course 2.270. Not offered 74-75, 75-76

2.848 Dynamics II

Dynamics of rigid bodies, moments of inertia in three dimensions, Euler's Equations, includes gyroscopic motion. *Prep. 2.847 Dynamics I.* See course 2.270. Not offered 74-75, 75-76

2.849 Automatic Control Engineering

Concepts of feedback control; formulation of equations, transfer functions, and block diagrams representing components and systems; linearization; Laplace transformation; stability. *Prep. Admission to the Graduate School of Engineering.* Offered fall quarter

2.850 Automatic Control Engineering

Study of control action; analysis and design by use of root-locus and frequency-domain techniques. *Prep. 2.849, Automatic Control Engineering.*

Offered winter quarter

2.851 Automatic Control Engineering

Further consideration of linear systems including compensation methods and multiple-inputs. Techniques for the treatment of non-linear systems. *Prep. 2.850, Automatic Control Engineering.*

Offered spring quarter

2.853 Fundamentals of Instrumentation

Theoretical principles underlying the design and operation of instruments for measurement and/or control. Analysis of stimulus-response relations. Industrial instruments for measurement and control, including those based on pneumatic and electrical systems. *Prep. Bachelor of Science degree.* Offered fall quarter

2.854 Industrial Process Control

Fundamental principles involved in automatic control of industrial processes. Economic considerations. Application of control instruments to obtain automatic control of temperature, pressure, fluid flow, liquid level, humidity, pH. *Prep. 2.853, Fundamentals of Instrumentation.*

Offered winter quarter

2.870 Ocean Engineering I

Extent of the ocean in general with its physical and chemical properties; emphasis on the three-dimensional temperature distribution with time as a variable; the salinity and its variation in oceanic space and time; the density of the ocean and its stability; temperature-salinity relationships and their connection with mixing processes with large water masses; evaporation and water budget of the earth, and ice in the ocean. *Prep. Admission to the Graduate School of Engineering.*

Offered fall quarter

2.871 Ocean Engineering II

Geophysical structure of the sea; forces and their relation to the structure of the ocean; ocean statics, oceanic kinematics; theory of ocean currents in a homogeneous and non-homogeneous ocean; strait currents; effect of wind; the mass field and density current; fundamental principles of oceanic circulation in the troposphere and stratosphere. *Prep. 2.870, Ocean Engineering I.*

Offered winter quarter

2.873 Geophysical Engineering

Theory of basic geophysical methods, seismology, magnetics, gravity, and electromagnetic potential relating to ocean research and exploration with emphasis on theory, data processing, computer applications; interpretation of data and their applications; instrument systems; survey procedures; profiling; surface ship systems applications and deep submersible applications. *Prep. Admission to the Graduate School of Engineering.*

Offered fall quarter

2.874 Ocean Measurements

Instrument design; theory application for physical and chemical properties;

bathymetry; temperature, velocity and geophysical aspects of seismic, gravity, magnetic, and electromagnetic methods. *Prep.* 2.873, *Geophysical Engineering.* Offered winter quarter

2.901 Advanced Thermodynamics

A critical examination of equilibrium thermodynamics from a rigorous viewpoint emphasizing fundamental concepts including: equilibrium, heat, and work; the first and second law of thermodynamics; energy; heat engines, simple systems, and open systems. *Prep. Admission to the Graduate School of Engineering.*

Offered fall quarter

2.902 Advanced Thermodynamics

Continuation of 2.901 including: examination of temperature scales; entropy and availability; the phase rule, single component systems; thermodynamic relations. Consideration is also given to the ideal gas; chemical potential and thermodynamics of ideal gas mixtures. *Prep. 2.901, Advanced Thermodynamics.*

Offered winter quarter

2.903 Advanced Thermodynamics

Embodyes the material in 2.901 and 2.902 Advanced Thermodynamics. *Prep. Admission to the Graduate School of Engineering.*

Offered winter quarter

2.904 Special Topics in Advanced Thermodynamics

Selected subjects of current interest in general thermodynamics including: chemical reactions; the law of stable equilibrium, normal and special systems, and the third law. Detailed analysis of the statistics of ensembles is also covered to emphasize the relationship between thermodynamics and statistical mechanics. *Prep. 2.902, Advanced Thermodynamics.*

Offered spring quarter

2.905 Cryogenic Engineering

Designed to provide a familiarity with the general field of cryogenics, some of the principal uses of cryogenics, and the ways of obtaining and preserving an environment at a low temperature. Refrigeration, cycle analysis, heat exchanger design, insulation systems, properties of materials, instrumentation problems and applications. Problems will be assigned typical of those which are encountered in the field and laboratory. *Prep. Admission to the Graduate School of Engineering.*

Offered fall quarter

2.906 Cryogenic Engineering

Continuation of 2.905, Cryogenic Engineering. *Prep. 2.905, Cryogenic Engineering.*

Offered winter quarter

2.907 Cryogenic Engineering

Application of Cryogenic Engineering Principles to the design of integrated systems. *Prep. 2.906, Cryogenic Engineering.*

Offered spring quarter

2.910 Conduction Heat Transfer

Basic laws of heat transfer; analytical solutions of single and multidimensional systems in steady and transient states with and without heat sources in cartesian, cylindrical, and spherical coordinates; chart solutions; Newtonian method, steady state and transient numerical analysis; generalized fin equation. *Prep. Elements of Heat Transfer.*

Offered fall quarter

2.911 Convection Heat Transfer

Fundamentals of convection; Reynolds, Prandtl, and Nusselt numbers; elements

of boundary layer theory; free and forced convection in ducts and over flat plates solved by dimensional, exact mathematical and approximate integral analyses for both laminar and turbulent flows; Reynolds analogy and Prandtl's modification; boiling and condensation; heat transfer in high speed flow; heat exchangers. *Prep. Elements of Heat Transfer.* Offered winter quarter

2.913 Radiation Heat Transfer

Basic laws of thermal radiation; Planck black body radiation; Kirchhoff's laws; Stefan-Boltzmann law; radiation properties of surfaces; radiative transfer between gray and non-gray diffuse and specular surfaces separated by transparent media; radiation properties of gases; radiative transfer through absorbing, emitting, and scattering media; radiative transfer in the presence of conduction and convective heat transfer. *Prep. Elements of Heat Transfer.*

Offered spring quarter

2.920 Direct Energy Conversion

The fundamental processes of direct energy conversion and their application to the design and operation of magnetohydrodynamic power generators, thermionic converters, fuel cells, and thermoelectric converters. *Prep. Admission to the Graduate School of Engineering.*

Offered 1974-75, fall quarter

2.921 Direct Energy Conversion

Continuation of 2.920. *Prep. 2.920, Direct Energy Conversion.*

Offered 1974-75, winter quarter

2.923 Special Topics in Direct Energy Conversion

Irreversible thermodynamics. Unified theory of energy conversion. *Prep. 2.921, Direct Energy Conversion.*

Offered 1974-75, spring quarter

2.930 Pumps

Deals mainly with centrifugal pumps, with brief references to other types; flow of fluids in pipes and conduits, system curves, pump head velocity diagrams and head development, efficiency; specific speed, net positive suction head, cavitation; affinity laws, selection of pumps to suit various operating conditions and methods of driving, parallel operation; automatic operation, types of construction and materials used, methods of priming centrifugal pumps, pumping of chemicals, oils, and sludges, special problems of pump installation and operation, water hammer in pump discharge lines. *Prep. Hydraulics.*

Offered 1974-75, spring quarter

2.931 Fans and Blowers

Flow of air in pipes and ducts, fan characteristics and laws, various types of fan wheels, inlet and outlet connections, fan capacity control, fan selection and testing. Compression of air and gases, flow in pipes, head-on blowers, performance curves, effect of changes in speed and inlet conditions, construction, regulation, selection, installation, and testing. Axial flow fans and blowers. Positive pressure blowers. *Prep. Thermodynamics.*

Offered 1975-76, spring quarter

2.932 Pollution Problems from Combustion Processes I

A major portion of the energy produced in the United States depends upon combustion processes including energy produced in electrical power generation, motor vehicles, and aircraft. Combustion processes have contributed to air, water, and noise pollution problems. This course examines combustion sys-

tems in detail to determine sources of pollution problems and to designate methods by which these problems can be met.

An overview of the energy production by electrical power generation systems, motor vehicles, and aircraft so that the magnitude of the contribution of these systems to the pollution problem can be assessed. These systems will be described as heat engines. A thermodynamic analysis will be made to evaluate their efficiencies. The correlation between heat engine efficiency and its effect on pollution problems will be discussed. *Prep. Admission to the Graduate School of Engineering.*

Offered 1975-76, fall quarter

2.933 Pollution Problems from Combustion Processes II

Basic principles of combustion processes are developed for an understanding of the emission products as a function of system operating conditions. Topics of thermochemistry, chemical equilibrium, chemical kinetics, conservation of energy, equation of motion, chemistry of hydrocarbons, and theories of combustion processes are presented toward this end. *Prep. 2.932, Pollution Problems from Combustion Processes I.*

Offered 1975-76, winter quarter

2.934 Pollution Problems from Combustion Processes III

Combustion systems include physical processes as well as chemical. Physical processes of fuel injection, atomization, vaporization, and mixing, and their relation to combustion systems, will be discussed. Details of operation of electrical power generation systems, automotive engines, and aircraft engines are examined to identify sources of pollution and designate methods for pollution control. *Prep. 2.933, Pollution Problems from Combustion Processes II.*

Offered 1975-76, spring quarter

2.935 Power Plant Design

Study of the thermodynamic cycles, equipment, and processes of the various types of power plants, with emphasis on modern central station practice. *Prep. Thermodynamics.*

Offered fall quarter

2.936 Power Plant Design

Continuation of 2.935, Power Plant Design. *Prep. 2.935.* Offered winter quarter

2.938 Power Generation Economics

Integrated study of the various factors affecting cost of power generation, including the effects of fuels availability and pricing, equipment selection and plant efficiency, siting and financial considerations. *Prep. 2.935.*

Offered spring quarter

2.942 Nuclear Engineering I

Topics include: growth of nuclear power industry; study of nuclear physics emphasizing atomic and nuclear structure, radioactive decay, and nuclear reactions with particular attention to fission and fusion; radiation health physics; principles of shielding; nuclear instrumentation; production and application of radioisotopes; neutron interactions and slowing down theory; neutron activation analysis. (Not open to students who have completed 2.236 & 2.237.) *Prep. Admission to Graduate School of Engineering.*

Offered fall quarter

2.943 Nuclear Engineering II

Comparison of thermal, fast, and breeder reactors; four factor formula and the neutron diffusion equation; one-group, modified one-group, two-group and multi-

group theory; bare and reflected thermal reactors; energy production and distribution within core; flux shaping; transient reactor behavior and control; factors affecting reactivity including temperature, pressure, void formation, fission product accumulation, fuel depletion and fuel breeding; Xenon buildup after shutdown. (Not open to students who have completed 2.236 & 2.237.) *Prep.* 2.942. *Offered winter quarters*

2.944 Nuclear Engineering III

Reactor design considerations; interrelationship of reactor physics, control, engineering, materials, safety, and fuel cycle management; reactor types; radiation damage and reactor materials; nuclear fuels; reactor heat transfer; economics of nuclear power; environmental effects. (Not open to students who have completed 2.236 & 2.237.) *Prep.* 2.943. *Offered spring quarters*

2.953 Advanced Physical Metallurgy III

Point defects in crystals; theory of diffusion in solids, including diffusion equations, mechanisms, effect of concentration gradients, diffusion in non-metallic solids; oxidation. *Prep.* A recent introductory material science course. *Offered 1974-75, spring quarter*

2.954 Advanced Physical Metallurgy I

Dislocation theory; including such topics as dislocation stress fields, self energy, velocity, interactions mechanisms, image forces, and theories of yielding. *Prep.* A recent introductory material science course. *Offered 1974-75, fall quarter*

2.956 Advanced Physical Metallurgy II

Mechanical behavior of metals. Application of dislocation theory to microplasticity, strain hardening, strengthening mechanisms and creep. *Prep.* 2.954, Advanced Physical Metallurgy I. *Offered 1974-75, winter quarter*

2.960 Thermodynamics of Materials I

Basic metallurgical thermodynamics encompassing first, second, and third laws, entropy, enthalpy, and free energy. *Prep.* Engineering Materials. *Offered 1975-76, fall quarter*

2.961 Thermodynamics of Materials II

Continuation of 2.960 with emphasis on solutions, activity, activity coefficients, the phase rule and applications to some metallurgical problems. *Prep.* 2.960, Thermodynamics of Materials I. *Offered 1975-76, winter quarter*

2.963 Thermodynamics of Materials III

The application of metallurgical thermodynamics to various process metallurgical problems, i.e., gas-solid systems, etc., plus kinetics of reactions and dynamics systems analysis. *Prep.* 2.960 or 2.961, Thermodynamics of Materials I or II. *Offered 1975-76, spring quarter*

2.965 Physical Ceramics

Introduction to ceramic fabrication processes. Characteristic of vitreous and crystalline solids, structural imperfections, and atomic mobility. Phase equilibria, nucleation, crystal growth, solid-state reactions, non-equilibrium phases, and effects on the resulting microstructure of ceramics. *Prep.* A recent introductory material science course, Physical Chemistry or Solid State Physics. *Offered 1974-75, fall quarter*

2.966 Physical Ceramics

Discussion of effects of composition and microstructure on the thermal, mechanical, optical, electrical, and magnetic properties of ceramic materials.
Prep. 2.965, Physical Ceramics. Offered 1974-75

2.970 Material Science and Engineering

Principles underlying the structure and properties of solid materials. The relationships of these principles to the properties and to applications in structures and devices. Both macroscopic-phenomenological and electronic-molecular approaches will be used. Materials will include metals and alloys, semiconductors, and dielectrics. Typical subjects are atomic and electronic structures, ordering, nucleation, crystal growth, and thermal properties. *Prep. A recent introductory material science course.* Offered 1975-76, fall quarter

2.971 Material Science and Engineering

Continuation of 2.970 into additional topics such as thermal, electric, magnetic, and optical properties; applications of solid-state phenomena to achieve functions embodied in transducers, filters, amplifiers, energy converters, and so forth. *Prep. 2.970, Material Science and Engineering.*

Offered 1975-76, winter quarter

2.972 Materials Science and Engineering III

Continuation of 2.971 plus a discussion of various special topics that will vary from year to year. Examples are: metastable phases and thin films. *Prep. 2.971, Materials Science and Engineering II.*

Offered 1975-76, spring quarter

2.975 Principles of X-Ray Diffraction

General properties of x-rays. X-Ray production and detection. Emission and absorption. Introduction to diffraction and factors influencing the intensities. Analysis of diffraction patterns. *Prep. A recent introductory material science course.* Offered 1975-76, fall quarter

2.976 Applications of X-Ray Diffraction

Experimental methods. Applications, including: single crystal orientation, crystallite size measurement, preferred orientation, residual stresses, precision lattice-parameter measurement, phase-diagram determination, chemical analysis. *Prep. 2.975, Principles of X-Ray Diffraction.* Offered 1975-76, winter quarter

2.983 Metallurgical Systems for Structural Applications

Several important metallurgical systems are studied with emphasis on categorizing their utility and explaining sources of their strength, fracture toughness and creep resistance. Materials considered include: high strength steels, maraging alloys, aluminum and titanium alloys, ceramics and metals for high temperature applications, metal matrix and resin matrix fibre composite materials. *Prep. An undergraduate materials science or metallurgy course.*

Offered 1975-76, spring quarter

2.985 Powder Metallurgy

Powder characteristics and methods of manufacture. Powder pressing: packing, interparticle bonding, effects of pressure. Principles of sintering. Characteristics and properties of products made from powdered materials. *Prep. A recent introductory material science course.* Offered 1974-75, spring quarter

2.986 Behavior of Materials Under High Pressures I

Historical development of high pressure research in brief. Basic design principles of static high pressure apparatus; use of gases, liquids and solids as pressure transmitting media; introduction to principles of shock wave method; equations of state of solids and their measurement at high pressures and at ultra high pressures. *Prep. Admission to the Graduate School of Engineering.*

Offered 1974-75, fall quarter

2.987 Behavior of Materials Under High Pressures II

Crystal structure transformation, electronic transitions and insulator-metal transitions under pressure; electrical and magnetic properties and deformations of solids under pressure; geological phenomena related to high pressures; current developments in high pressures. *Prep. 2.986, Behavior of Materials Under High Pressure I.*

Offered 1974-75, winter quarter

2.990 Mechanical Engineering Seminar

Discussions by industrial leaders, faculty, and graduate students on various subjects. Open to day students only. *Prep. Admission to Master of Science program.*

Offered yearly, fall and winter quarters

2.991 Thesis (Master's Degree)

Analytical and/or experimental work conducted under the auspices of the department. Open to day students only. *Prep. Admission to Master of Science program.*

Offered yearly, all quarters

2.992 Special Problems in Mechanical Engineering

Theoretical or experimental work under individual faculty supervision. *Prep. Consent of department chairman.*

Offered yearly, all quarters

2.993 Special Topics in Mechanical Engineering

Topics of interest to the staff member conducting this class are presented for advanced study. *Prep. Permission of department staff.*

Offered yearly, all quarters

2.994 Doctoral Reading

Material approved by the candidate's adviser (only S or F grades will be assigned for this course). *Prep. Passing of Ph.D. Qualifying Exam.*

Offered yearly, all quarters

2.995 Thesis (Ph.D. Degree)

Theoretical and experimental work conducted under the supervision of the department. Open to day students only. *Prep. Admission to the Doctoral Program in Mechanical Engineering.*

Offered yearly, all quarters

2.996 Thesis (Mechanical Engineer Degree)

Analytical and/or experimental work conducted under the auspices of the department. Open to day students only. *Prep. Admission to the Mechanical Engineer Degree Program.*

Offered yearly, all quarters

ELECTRICAL ENGINEERING

3.800 Plasma Engineering I

Behavior, diagnostics, and generation of plasma and gas discharges; emphasis on the engineering and experimental point of view rather than on a rigorous theoretical treatment. Current literature on a variety of plasma engineering applications will be introduced throughout the course. First quarter topics include: dynamics of charged particles in static electric and magnetic fields, E and M wave-plasma interactions, Infinite and Finite Media, elastic and inelastic collisions. *Prep. Bachelor of Science degree in Electrical Engineering or Physics or 3.977, Precis of Modern Electrical Engineering III.* Fall quarter

3.801 Plasma Engineering II

Ionization, diffusion, sheaths, glow and arc discharges, plasma oscillations, and plasma diagnostic techniques. *Prep. 3.800, Plasma Engineering I.*

Winter quarter

3.802 Plasma Engineering III

Principles of MHD and Controlled Fusion Engineering. General plasma engineering applications. *Prep. 3.801, Plasma Engineering II.* Spring quarter

3.803 Plasma Engineering (4 q.h. credits)

Offered days. Includes the material given in 3.800 and 3.801 — Plasma Engineering I and II. *Prep. Bachelor of Science degree in Electrical Engineering or Physics or 3.977, Precis of Modern Electrical Engineering III.* Winter quarter

3.806 Lasers I

Review of basic optical principles and atomic physics; introduction to optical coherence; models for the interaction of electromagnetic radiation with matter; a general description of lasers is given. *Prep. Bachelor of Science degree in Engineering or Science.* Fall quarter

3.807 Lasers II

Laser threshold and rate equations; elementary resonator theory and fabrication; giant pulse operation; specific solid-state, liquid, and gas lasers; and laser systems. *Prep. 3.806, Lasers I.* Winter quarter

3.810 Thermonuclear Fusion Energetics I

Thermonuclear fusion as an ultimate energy source. Generation of thermonuclear plasmas in confinement devices. Principles of laser-induced fusion. Thermonuclear reactor design. Problems in the magnetic confinement of thermonuclear plasmas. *Prep. Bachelor of Science degree in engineering or science.* Fall quarter

3.811 Thermonuclear Fusion Energetics II

Streaming instabilities and parametric amplification in plasmas. Generation of thermonuclear plasmas from relativistic beams. Shock waves in thermonuclear plasmas. *Prep. 3.810 Thermonuclear Fusion Energetics I.* Winter quarter

3.812 Thermonuclear Fusion Energetics III

Plasma electrodynamics. Power gain of charged particles in thermonuclear plasma-radiation systems. Theory of Landau damping and micro-instabilities in collisionless plasmas. *Prep. 3.811 Thermonuclear Fusion Energetics II.*

Spring quarter

3.817 Physical Acoustics

Radiation, transmission, and absorption phenomena of plane and spherical waves. Distributed-system analogies, simple sources, dipole sources, radiation impedance, and radiation patterns. Diffraction theory and ray acoustics. Finite amplitude waves and shock waves. The effects of inhomogeneities and of dissipation processes on sound transmission. *Prep. Bachelor of Science degree in Engineering or Science.* Fall quarter

3.818 Speech Communications

Theory of acoustic transducers, such as microphones, loudspeakers, and horns. Mechanism of speech production and the acoustic properties of the vocal system. Hearing and psychoacoustics, Analog synthesizers of speech. Speech coding and transmission systems. *Prep. 3.817 Physical Acoustics.* Winter quarter

3.819 Underwater Sound

Fundamentals of sonar and acoustic signal processing. Echo ranging and direct listening. Model of the underwater acoustic channel. Matched filters and correlation detection. *Prep. 3.818, Speech Communications.* Spring Quarter

3.823 Mathematical Methods in Electrical Engineering (4 q.h. credits)

This course, offered days, embodies the material in 3.8C4 and 3.8C5, Mathematical Methods in Electrical Engineering II-A and II-B. (Not open to Northeastern graduates who have completed 3.293). *Prep. Bachelor of Science degree in Engineering.* Fall and winter quarters

3.824 Linear Systems Analysis I (Fundamental Precepts)

A study of the basic concepts of time and frequency domain analysis including differential equations and systems of simultaneous first order equations, integral solutions including superposition and convolution integrals and Green's function solutions; the application of complex variable theory to the study of Laplace and z-transforms; the application of matrix theory to systems analysis. *Prep. Bachelor of Science degree in Electrical Engineering or 3.975, Precis of Modern Electrical Engineering I. Recommended are courses 3.8C4 and 3.8C5 or their equivalent.* Fall, winter, and spring quarters

3.825 Linear Systems Analysis II-A (State Variable Representation of Systems)

A continuation of program begun with 3.824. Introduction to state variable analysis of continuous and discrete systems. Standard canonical representations. Computer simulation of systems behavior. Solution of state equations for linear time invariant systems. Analysis of transient response. *Prep. 3.824, Linear Systems Analysis I or equivalent.* Fall, winter, and spring quarters

3.826 Linear Systems Analysis II-B (Applications of State Variable and Transform Techniques)

A continuation of 3.825. Extensions of techniques to time varying systems. Stability and related matters. Introduction to optimization and optimal systems. Observability and controllability. Further applications to discrete as well as continuous systems. The application of digital computers to systems analysis. *Prep. 3.825, Linear Systems Analysis II-A.* Winter and spring quarters

3.827 Linear Systems Analysis through State Variable and Transform Techniques (4 q.h. credits)

Offered days. Includes the material given in 3.825 and 3.826, Linear Systems

Analysis II-A and II-B. Prep. Bachelor of Science degree in Electrical Engineering and 3.824, Linear Systems Analysis I or equivalent.

Fall and winter quarters

3.830 Network Synthesis I-A

Matrix circuit analysis including m-port parameter systems. Positive-real functions. Energy functions. Driving-point synthesis techniques for LC, RC, and RL networks. Prep. Bachelor of Science degree in Electrical Engineering or 3.975, Precis of Modern Electrical Engineering I.

Fall, winter, and spring quarters

3.831 Network Synthesis I-B

Driving-point synthesis of RLC networks. Properties of two-port networks. Two-port synthesis, including the parallel ladder realization. Lattice synthesis. Prep. 3.830, Network Synthesis I-A.

Fall, winter, and spring quarters

3.832 Network Synthesis I (4 q.h. credits)

Offered days. Includes the material given in 3.830, Network Synthesis I-A and 3.831, Network Synthesis I-B. Prep. Bachelor of Science degree in Electrical Engineering or 3.975, Precis of Modern Electrical Engineering I.

Fall and spring quarters

3.833 Network Synthesis II

Scattering, immittance, and hybrid formalisms for linear networks; state-space formulation and techniques for time-invariant and time-varying networks; introduction to passive n-port synthesis. Prep. 3.831, Network Synthesis I-B or 3.832, Network Synthesis I.

Fall quarter

3.834 Advanced Network Theory I

General realizability of linear lumped and distributed systems; synthesis of reciprocal and non-reciprocal n-port networks; lossless microwave multi-port junctions; stability characterizations of active networks; theory of linear active multi-port networks. Prep. 3.833, Network Synthesis II.

Winter quarter

3.835 Advanced Network Theory II

Interrelationship between parts of network functions; theory of optimum broadband matching; approximation methods and insertion loss synthesis; analysis and synthesis of transmission line filters and equalizers; gain-bandwidth theory of negative resistance devices including tunnel diodes, varactors, avalanche transit-time, and bulk-effect devices. Prep. 3.834, Advanced Network Theory I.

Spring quarter

3.837 Introduction to Graph Theory

Fundamentals of graph theory, including blocks, trees, connectivity, partitions, traversability, line graphs, factorization, coverings, planarity, matrices, digraphs, and enumeration problems. Selected applications of graph theory in such fields as network theory, switching theory, and computer science. Prep. Bachelor of Science degree in Engineering or Science.

Fall quarter

3.838 Nonlinear Circuit Analysis I

Numerical, graphical, and analytical methods for the solution of physical systems described by nonlinear differential equations. Geometric analysis in second-order systems. Perturbation and averaging theory. Prep. 3.831, Network Synthesis I-B or 3.832, Network Synthesis I.

Winter quarter

3.839 Nonlinear Circuit Analysis II

Linear, time-varying systems and their relationship to certain nonlinear problems. The WJKB approximation. The Hill and Mathieu Equations. Stability of nonlinear systems. Lyapunov Theory. Selected topics in nonlinear analysis according to group interest. *Prep. 3.838, Nonlinear Circuit Analysis I.* Spring quarter

3.840 Linear Active Circuits I-A

Active networks are developed from device representation and appropriate circuit theory concepts. Topics included are application of flowgraphs and matrices to design and analysis, development of solid state device models, stability, integrated circuitry limitations and dominant pole analysis, and realization from open and short-circuit impedance concepts. These are applied to the realization, operation, and optimization of gainband-width products of wide-band amplifiers to obtain specific characteristics such as Butterworth and other functions. *Prep. Bachelor of Science degree in Electrical Engineering or 3.967, Precis of Modern Electrical Engineering II.* Fall quarter

3.841 Linear Active Circuits I-B

The results of 3.840, Linear Active Circuits I-A, are extended to include narrow-band, band pass amplifiers, and feedback amplifier concepts. The effects of feedback upon gain, impedance noise, and stability are developed from return difference and ratio viewpoints utilizing open and short-circuit loop gain concepts. Consideration is given to the synthesis of driving point and transfer functions using active filters, negative impedance converters, and other basic building blocks. *Prep. 3.840, Linear Active Circuits I-A.* Winter quarter

3.842 Linear Active Circuits I (4 q.h. credits)

Offered days. Includes the material given in 3.840, Linear Active Circuits I-A and 3.841, Linear Active Circuits I-B. *Prep. Bachelor of Science degree in Electrical Engineering or 3.976, Precis of Modern Electrical Engineering II.*

Fall and winter quarters

3.843 Linear Active Circuits II

A continuation of the material covered in Linear Active Circuits I-A and I-B. Emphasis will be placed on feedback systems, including multiloop amplifier design. These techniques will be applied to integrated circuit realizations of basic active networks. *Prep. 3.841, Linear Active Circuits I-B or 3.842, Linear Active Circuits I.* Spring quarter

3.845 Active Network Synthesis

Basic methods of active network synthesis are introduced through three commonly used approaches: feedback amplifier, negative impedance convertor, and gyrator; structures of Sallen and Key, Kuh, Linvill, Yanagisawa, Rohrer, Kinariwals, Sepress, and Calahan; consideration of the practical realization of NIC's and gyrators, standard decomposition methods and sensitivity; work of Sandberg, Larky, Newcomb, Daniels, Horowitz, and Thomas. *Prep. 3.381, Network Synthesis I-B and 3.841, Linear Active Circuits I-B or equivalent.* Fall quarter

3.853 Solid State Device Theory and Practice (4 q.h. credits)

This course meets twice weekly. On one night there is a two-hour lecture; on the other, a three-hour lab. The course carries four quarter hours of credit.

A case method study of solid state devices with a laboratory tightly integrated with the classroom work. The methodology developed is fundamental to the discrete and integrated circuit technology. The classroom portion of the course is devoted to junction diode and bipolar transistor theory including the physics of achieving a given design. In the laboratory, the student designs, builds, and tests diodes and transistors to meet certain electrical characteristics. The devices achieved are seldom of commercial quality, but sufficient equipment is available in the laboratory to make practical device processing possible even for completely untrained personnel. *Prep. An undergraduate level background in electronics and semiconductor devices.*

Fall quarter

3.854 Solid State Theory and Practice (4 q.h. credits)

The course is offered on the same basis as 03.853 and is a continuation of that course. The central topic is field effect transistors with appropriate design problems for the laboratory. *Prep. 3.853 Solid State Device Theory and Practice.*

Spring quarter

3.8G1 Characteristics and Models of Solid State Devices I

This sequence of three courses is designed to develop real insight into the operation of a broad range of semiconductor devices. Important topics in the physics of semiconductors to provide the background necessary for device analysis are discussed. Analysis of fundamental building-block units of which devices are made including the PN junction, the ohmic contact, and the Schottky barrier. Each is examined under reasonable extremes of bias and temperature to establish the electrical behavior expected from such elementary units. *Prep. Bachelor of Science degree in Electrical Engineering or equivalent.*

Fall quarter

3.8G2 Characteristics and Models of Solid State Devices II

Detailed analysis of the bipolar transistor, metal-oxide-semiconductor interface, its influence on the behavior of real junctions, and the various realizations of the field-effect transistor. *Prep. 3.8G1 Characteristics and Models of Solid State Devices I.*

Winter quarter

3.8G3 Characteristics and Models of Solid State Devices III

A continuation of the work of the previous two courses. A detailed analysis of the performance of FET's will permit a critical comparison of field effect and bipolar transistors. Solid state microwave devices; devices that are both unique to microwave applications and the relevant low-frequency elements which require somewhat different analysis at microwave frequencies. An examination of noise in semiconductor devices. *Prep. 3.8G2 Characteristics and Models of Solid State Devices II.*

Spring quarter

3.860 Pulse Processing I

The principles and techniques of pulse-forming and pulse-processing circuits, basic radar, television, digital computation, pulse modulation systems, and data-processing systems. Wave shaping circuits, logic circuits, switching circuits, digital devices, and time base generators will be covered. *Prep. Bachelor of Science degree in Electrical Engineering or 3.975, 3.976, and 3.977, Precis of Modern Electrical Engineering I, II, and III.*

Winter quarter

3.861 Pulse Processing II

Continuation of 3.860, Pulse Processing I, to include digital filters and corre-

lators, pulse transformers, memory devices, and linear delay devices. *Prep. 3.860, Pulse Processing I.* Spring quarter

3.865 Radar Systems I

Emphasis on the systems aspects of radar engineering. Topics covered include antennas; low-noise receivers; high-power transmitters; range, angle, and Doppler tracking systems; search radar systems. Mathematical descriptions are used throughout. *Prep. Background in probability and Fourier analysis.* Fall quarter

3.866 Radar Systems II

Continuation of 3.865, Radar Systems I, a further consideration of systems aspects. The principles of radar detection theory; matched filter and correlation receiver design; radar ambiguity function; radar uncertainty principles; radar waveform synthesis; fundamental accuracy limits; generalized tracking problems *Prep. 3.865, Radar Systems I.* Winter quarter

3.867 Radar Systems III

Advanced topics in radar engineering including modern tracking techniques waveform synthesis, multifunction array radar techniques, and selected topics in radar-sensing techniques and devices. *Prep. 3.866, Radar Systems II.*

Spring quarter

3.871 Communications Systems I

Primarily concerned with radio communication systems as used in terrestrial and space communication applications. Antenna gain, space loss, cosmic and atmospheric noise, and receiver noise as factors influencing the signal-to-noise ratio in space and satellite repeater systems; channel models are developed for over-the-horizon systems utilizing ionospheric propagation and exhibiting fading and multipaths; contemporary systems are discussed from the standpoint of signal spectrum, noise power and message ambiguity as exhibited at the output of the intermediate frequency receiver. *Prep. Background in probability and Fourier analysis.* Fall quarter

3.872 Communications Systems II

Primarily concerned with the theoretical aspects of analogue modulation systems used in radio and space communications. First and second threshold effects will be discussed in conjunction with signal-to-noise considerations for amplitude and angle modulated systems. Treatment of frequency feedback and phase-locked loops will be included in the discussion of frequency modulation and detection. Frequency division multiplexing will include sub-carrier pre-emphasis and comparative performance figures for SSSC/FM and FM/FM. *Prep. 3.871, Communications Systems I or 3.900, Applied Probability and Stochastic Processes A.*

Winter quarter

3.873 Communications Systems III

Continuation of techniques of 3.872 to cover digital modulation systems and time-division multiplexing. Adaptive sampling, aliasing, and interpolation will be discussed along with PAM/FM. Pulse code modulation systems utilizing frequency and phase shifted carriers will be compared under noise conditions. Treatment will be given to the use of codes with special correlation, modulation sequences, and phase-coherent communication. *Prep. 3.872, Communications Systems II.*

Spring quarter

3.875 Electromagnetic Theory A

Maxwell's equations and related electromagnetic laws and relations; basic properties of matter; electromagnetic potentials; the scalar and vector Poisson, D'Alembert, and Helmholtz equations; Green's functions; both mathematical and physical aspects of the theory and their relation to engineering applications. *Prep. Bachelor of Science degree in Electrical Engineering or 3.977, Precis of Modern Electrical Engineering III, Advanced Calculus, and Vector Analysis.*

Fall quarter

3.876 Electromagnetic Theory B

Basic radiation phenomenon including retarded potentials, radiation from moving charges, electromagnetic energy, and energy-related theorems. Propagation of plane waves in media with real and complex constitutive parameters. Fundamental theory of guided waves. *Prep. 3.875, Electromagnetic Theory A.*

Winter quarter

3.877 Electromagnetic Theory (4 q.h. credits)

Offered days. Includes the material given in 3.875 and 3.876, Electromagnetic Theory A and B. *Prep. Bachelor of Science degree in Electrical Engineering or 3.977, Precis of Modern Electrical Engineering III.* Winter and spring quarters

3.878 Advanced Electromagnetic Theory A

More advanced approaches to problems in electromagnetic theory of interest to electrical engineers — for example: waveguide, antennas, diffraction, and scattering; approximation techniques for obtaining useful solutions of field theory problems including integral equation, perturbation, and variational techniques. *Prep. 3.876, Electromagnetic Theory B or 3.877, Electromagnetic Theory.*

Spring quarter

3.879 Advanced Electromagnetic Theory B

Special relativity and relativistic electrodynamics. Radiation from moving charges. Statistical concepts and propagation in random media. Introduction to magnetohydrodynamics and plasma physics. *Prep. 3.878 Advanced Electromagnetic Theory A.*

Fall quarter

3.880 Microwave Theory

Propagation of electromagnetic waves on periodic structures. Propagation on a helix. Waves on electron beams. Coupled-mode theory. Traveling-wave devices. Propagation in anisotropic media. Ferrite devices. *Prep. 3.876, Electromagnetic Theory B or 3.877, Electromagnetic Theory.*

Spring quarter

3.881 Microwave Circuits I

Review of microwave circuit theorems; scattering matrices and applications; eigenvalue problem; symmetrical and miscellaneous junctions; applications of -db couplers; polarizers, phase shifters and attenuators; non-reciprocal and ferrite devices. *Prep. 3.876, Electromagnetic Theory B or 3.877, Electromagnetic Theory.*

Winter quarter

3.882 Microwave Circuits II

One-port resonant cavity; transmission cavity; analysis and synthesis of microwave filters; traveling-wave resonators; periodically loaded lines; selected microwave system considerations. *Prep. 3.881, Microwave Circuits I.* Spring quarter

3.883 Advanced Electromagnetic Theory (4 q.h. credits)

Offered days. Includes the material given in 3.878 and 3.879 — Advanced Elec-

tromagnetic Theory A and B. Prep. 3.876, *Electromagnetic Theory B* or 3.877 *Electromagnetic Theory*. Spring quarter

3.885 Antennas and Environmental Sensors

Fundamental theory of the transient and steady state operation of radiating devices with emphasis on wire type antennas — although more complex structures will also be studied; use of antennas for environmental probes and for mapping and measuring the resources of the earth; remote sensing from radiating structures; use of computers in solving antenna problems. Prep. 3.876 *Electromagnetic Theory B* or 3.877, *Electromagnetic Theory*. Spring quarter

3.887 Biological Picture Processing

The preparation and meaning of greatly magnified pictures of biological objects. Electron microscope studies of particular biological systems; practical problem in specimen preparation and the limitation of optical and electron optical systems; reconstruction of the three-dimensional structure of the specimen using both real space and Fourier techniques; use of high speed computers in processing and interpreting the pictorial data. As time permits, other optical methods for gathering biological pictures will be discussed. Prep. Bachelor of Science degree in Engineering or Science. Spring quarter

3.890 Electromagnetic Wave Propagation I

Topics in wave propagation of prime importance in communications and space physics. Review of wave propagation in a homogeneous medium. Physical processes in the atmosphere. The formation and structure of the ionosphere. Basic magneto-ionic theory. Propagation of waves in a spatially varying medium. Radar theory. Prep. 10.9N2, *Advanced Mathematics* or equivalent. Winter quarter

3.891 Electromagnetic Wave Propagation II

Application of the theory of the oblique incidence of radio waves on the ionosphere, including the effects of the presence of the geomagnetic field, to radio communications. The interpretation of ionograms. Path prediction and field strength computations. Absorption. Top side soundings. Incoherent thermal scatter. Ionospheric irregularities and motions, and their study by space and frequency diversity techniques and other methods. Prep. 3.890, *Electromagnetic Wave Propagation I*. Spring quarter

3.892 Introduction to Digital Computer Programming

Analysis of assorted problems of differing types and discussion of potential solution methods; transformation of chosen solution methods into detailed flowcharts; principles of computer programming: logical decision trees, loops, arrays, subroutines, internal checks, error handling, input, output, and the use of library routines; implementation of these principles using the FORTRAN language including its advanced features; principles of program testing and the circumvention of language restrictions. (Not open to those who have completed 3.970, Digital Computer Programming I.) Prep. Bachelor of Science degree in Engineering or Science. Fall quarter

3.893 Digital Computer Programming I

First quarter of a three-quarter sequence of systems programming and language processors. Topics covered in the sequence include: machine structure, machine language, assembly language; assemblers, macros, macro-processors;

searching and sorting; loaders; data structures, storage allocation; high-level languages; compilers; operating systems; management of memory, processors, devices; multiprocessing and multiprogramming. *Prep. B.S. degree in Engineering or Science and knowledge of FORTRAN IV, ALLOL, or PL/I.*

Fall quarter

3.894 Digital Computer Programming IIContinuation of 3.893. *Prep. 3.893 Digital Computer Programming I.*

Winter quarter

3.895 Digital Computer Programming IIIContinuation of 3.894. *Prep. 3.894 Digital Computer Programming II.*

Spring quarter

3.898 Introduction to Combinatorial Mathematics

An introduction to applied combinatorial mathematics. Topics include permutations and combinations, generating functions, recurrence relations, the inclusion-exclusion principle, and Polya's Theory of counting. *Prep. Bachelor of Science degree in Engineering or Science.*

Fall quarter

3.899 Introduction to Optimization Techniques

Selected topics in optimization techniques including: transport networks, matching theory, linear programming, and introduction to dynamic programming. Illustrative applications will be given in the areas of computer science, information processing, operations research and control theory. *Prep. 3.898 Introduction to Combinatorial Mathematics.*

Winter quarter

3.8C1 Mathematical Methods in Electrical Engineering I-A

Complex variable theory; mapping by functions, definite and indefinite integrals, Cauchy integral formula, Laurent series, the residue theorem and branch points. Not open to Northeastern graduates who have completed 3.292. *Prep. Bachelor of Science degree in Engineering or Science.*

Fall quarter

3.8C2 Mathematical Methods in Electrical Engineering I-B

A continuation of 3.8C1 that includes application of complex variable theory to Fourier theory, Hilbert transforms, and conformal transformations in the analysis of linear systems and in electrostatics; the Schwarz-Christoffel transformation, Poisson's integral formula and concept of analytic continuation. *Prep. 3.8C1, Mathematical Methods in Electrical Engineering I-A.*

Winter quarter

3.8C4 Mathematical Methods in Electrical Engineering II-A

Linear algebraic equations; Gauss algorithm; Linear operators in an n-dimensional vector space over infinite and finite fields; characteristic value problem; minimum polynomial; functions of a matrix; Cayley-Hamilton theorem; Sylvester's identity; matrix transformations: equivalence, congruence, similarity; quadratic forms; definiteness; canonical forms under equivalence and congruence transformation; polynomial matrices. *Prep. Bachelor of Science degree in Electrical Engineering.*

Fall quarter

3.8C5 Mathematical Methods in Electrical Engineering II-B

Smith normal form; determinantal divisors; invariant factors; elementary divisors; canonical forms under similarity: companion forms and Jordan form; method of ordan chains; Segre, Ferrer, and Weyr characteristics; decomposition of a vector space into invariant subspaces. *Prep. 3.8C4, Mathematical Methods in Electrical Engineering II-A.*

Winter quarter

3.8T1 Numerical Methods and Computer Applications I

Survey of numerical methods applied to engineering and scientific problems with emphasis on machine implementation and problem solving; roundoff errors and cumulative errors; difference and summation calculus; roots of polynomials and nonlinear functions; orthogonal functions including polynomials, least squares, and Chebyshev approximation of functions; systems of algebraic equations, matrix notation, and machine implementation; inversion of matrices including iterative methods; sparse matrix techniques. *Prep. Bachelor of Science in Engineering, Mathematics, or Physics; a working knowledge of FORTRAN.*

Fall quarter

3.8T2 Numerical Methods and Computer Applications II

Interpolation; numeric quadrature; numeric integration of ordinary differential equations including predictor-corrector methods; stiff dynamic equations partial differential equations, approximations, boundary value problems. *Prep. 3.8T1, Numerical Methods and Computer Applications I.*

Winter quarter

3.8T3 Numerical Methods and Computer Applications III

Linear and dynamic programming, steepest descent and simplex methods, with application to nonlinear functions in n-dimensional space; eigenvalues and eigenvectors of matrices; approximate location of eigenvalues; stability; Routh-Hurwitz criterion; more specialized techniques including the fast Fourier transform, digital simulation of analog computation, system modelling, etc. *Prep. 3.8T2, Numerical Methods and Computer Applications II.*

Spring quarter

3.8T7 Digital Filtering I

Representation of discrete signals and systems; z-transforms and discrete Fourier transforms; difference equations and state space representation of discrete systems; design of digital filters; recursive and nonrecursive. *Prep. 3.824, Linear Systems Analysis I or equivalent.*

Fall quarter

3.8T8 Digital Filtering II

Algorithms for fast Fourier transforms, e.g., Cooley-Tukey, Sande-Tukey, etc. radix two, four and arbitrary algorithms; digital spectra, smoothing techniques spectral window; effects of quantization truncation and parameter inaccuracies system performance in the presence of noise; applications to signal processing problems and the solution of partial differential equations. *Prep. 3.8T7, Digital Filtering I or consent of the instructor.*

Winter quarter

3.8T9 Digital Filtering (4 q.h. credits)

This course, offered days, embodies the material in 3.8T7 and 3.8T8, Digital Filtering I and II. *Prep. 3.824, Linear Systems Analysis I or equivalent.*

Spring quarter

The two-part sequence which follows serves to introduce students in engineering and physics to the notions of probability, random variables and stochastic processes. The subject matter is given below.

3.900 Applied Probability and Stochastic Processes A

Introductory probability, sample space and random variables, examples of discrete and continuous probability distribution functions, averages, moments and characteristic function, multivariate distributions, change of variables and functions of variables, central limit theorem, description of stochastic vectors. *Prep. Bachelor of Science degree in Engineering or Science.*

Fall, winter, and spring quarter

3.901 Applied Probability and Stochastic Processes B

General concepts of stochastic processes, stationarity and ergodicity, stochastic continuity and differentiation, the Gaussian process, linear systems with stochastic inputs, correlation functions and power spectra, stochastic orthogonality and linear mean-square estimation filtering and prediction. *Prep. 3.900, Applied Probability and Stochastic Processes A.* Fall, winter and spring quarters

3.902 Applied Probability and Stochastic Processes (4 q.h. credits)

Offered days. Includes the material given in 3.900, Applied Probability and Stochastic Processes A and 3.901, Applied Probability and Stochastic Processes B. *Rep. Bachelor of Science degree in Engineering or Science.*

Fall, winter, and spring quarters

3.903 Information Theory

Deals principally with three aspects of information theory; the statistical description of sources and the probabilistic measure of their information contents, the determination of channel capacity, and the fundamental coding theorems. *Rep. 3.900, Applied Probability and Stochastic Processes A or 3.902, Applied Probability and Stochastic Processes or Probability.* Fall quarter

3.904 Error Correcting Coding

Error correcting codes and their decoding techniques which show promise for practical applications in digital communication and computer systems. Emphasis on the linear block codes based on the algebraic structure; cyclic codes for random error correction (B-C-H codes) and burst error correction. Some knowledge of elementary aspects of modern algebra is desirable but not necessary. *Rep. Bachelor of Science degree in Engineering or Science.* Winter quarter

3.905 Information Theory and Coding (4 q.h. credits)

Offered days. Includes the material given in 3.903, Information Theory and 3.904, Error Correcting Coding. *Prep. 3.900, Applied Probability and Stochastic Processes A or 3.902, Applied Probability and Stochastic Processes.* Spring quarter

3.906 Detection and Estimation Theory A

This course presents the classical theory of signal detection and estimation. Particular topics include: likelihood ratio tests for detection of known or random signals; calculation of error probabilities; the signal selection problem; and maximum likelihood estimation of signal parameters. *Prep. 3.901, Applied Probability and Stochastic Processes B or 3.902, Applied Probability and Stochastic Processes.* Winter quarter

3.907 Detection and Estimation Theory B

This course is a continuation of 3.906 stressing application of the theory. Particular topics include: synthesis of an adaptive receiver; ambiguity function; estimation of angle modulated signals; and selection of features and training algorithms in pattern recognition. *Prep. 3.906, Detection and Estimation Theory A.* Spring quarter

3.908 Special Topics in Communication Theory

Current aspects of communication theory not covered in previous courses. Subject matter may change from year to year. Subjects in 1974-75 and 1975-76 are:

Fall quarter — Applications in Optics

Characterization and processing of optical signals. Topics include a linear system theory of imaging; the lens as a Fourier transformer; modulation

transfer function; phase distortions; film and diode detector noise; coherent (holographic) and incoherent filtering; synthetic apertures; sampled images (aliasing, sampling jitter, noise); digital picture processing (detection, filtering, enhancement); and bandwidth comparison for transmission or storage. Prep. 3.901 *Applied Probability and Stochastic Processes B*.

Spring Quarter — Topics on Coding

Convolutional coding and probabilistic decoding, arithmetic codes, combination of codes, coding for ranging and synchronization. Prep. 3.904 *Error-Correcting Coding* or 3.905, *Information Theory and Coding*.

3.9C1 — Data Transmission I

Deals with the theoretical and practical aspects of digital data transmission in the presence of channel distortion and additive noise. Topics covered in this quarter include the basic binary and M-ary modulation techniques namely PSK, PAM, FSK, orthogonal and bi-orthogonal signaling, and their performance in an additive Gaussian noise channel; signal design techniques for band limited channels; Nyquist criteria; effect of channel amplitude and delay distortion on performance; and adaptive equalization. Prep. 3.901, *Applied Probability and Stochastic Processes B* or 3.902, *Applied Probability and Stochastic Processes*.

Fall quart

3.9C2 — Data Transmission II

Discussion of several adaptive equalization algorithms for combatting intersymbol interference; maximum likelihood sequence estimation and the Viterbi algorithm; the characterization of fading multipath channels; diversity reception techniques; characterization of atmospheric and man-made (impulsive) noise in radio communications, its effect on error-rate performance; and receive processing techniques for combatting impulsive noise. Prep. 3.901, *Applied Probability and Stochastic Processes B* or 3.902, *Applied Probability and Stochastic Processes*.

Winter quart

3.909 Detection and Estimation Theory (4 q.h. credits)

Offered days. Includes the material given in 3.906 and 3.907, Detection and Estimation Theory A and B. Prep. 3.901, *Applied Probability and Stochastic Processes B* or 3.902, *Applied Probability and Stochastic Processes*.

Winter quart

3.910 Nonlinear Systems I

Operators and functionals. Functional power series representation of nonlinear systems. Functional representation of the response of a nonlinear system when its input is either a constant, a sinusoid, a transient. System transforms. Applications to the analysis and synthesis of nonlinear systems in terms of function power series. Prep. *An undergraduate course in Signals and Systems* and 3.901 *Applied Probability and Stochastic Processes A* or equivalent.

Fall quart

3.911 Nonlinear Systems II

Nonlinear systems with random inputs. Functional representation of the response of a nonlinear system when its input is a random process. Orthogonal systems functionals. Representation and analysis of nonlinear systems in terms of orthogonal systems of functionals. The optimum nonlinear filter, predictor, and general operator. Special classes of nonlinear systems. Determination of optimum nonlinear systems for generalized error criteria. Prep. 3.910, *Nonlinear*

Systems I and either 3.901, Applied Probability and Stochastic Processes B or 3.902, Applied Probability and Stochastic Processes. Winter quarter

3.912 Nonlinear Systems III

Functional analysis of systems characterized by nonlinear differential equations. Operator approach to system theory and its relationship to differential equation representations. The methods of iteration in nonlinear theory and its application to feedback systems. Prep. 3.911, *Nonlinear Systems II*. Spring quarter

3.913 Optical Storage and Display

Survey of materials and methods for the storage and display of information. Topics included are: photographic film, holograms, storage tubes, magneto-optical films, photochromic materials, electro-optical crystals, evaporated thin films and liquid crystals. Prep. 3.914, *Electro-Optics I* or equivalent.

Fall quarter

3.914 Electro-Optics I — Introduction

Introduction to the principles of electro-optical systems; imaging and non-imaging devices. Topics included are: optical imaging, sources, detectors, transmission, absorption scattering, polarization, system evaluation and limitation. Prep. 10.8A4, *Advanced Mathematics* or 3.823, *Mathematical Methods in Electrical Engineering* or equivalent.

Spring quarter

3.915 Electro-Optics II — Imaging Devices

Detailed theory of image formation; evaluation of optical instruments; detailed description of representative systems; test procedures and critical alignment techniques. Prep. 3.914, *Electro-Optics I* or equivalent.

Fall quarter

3.916 Fourier Optics I

This two-quarter sequence covers: optical diffraction and imaging problems of linear systems; necessary tools of Fourier Analysis and linear systems analysis which occur when solving the scalar wave equation; waves and their properties; reflection, refraction, polarization, and propagation of waves; foundations of scalar diffraction theory — including Fresnel and Fraunhofer diffraction, interferometry, division of amplitude, division of wavefront, interferometric instrumentation, Fourier transforming, image properties of lenses, coherent and incoherent imaging; and advanced topics in the application of communication theory to optical problems, transfer and spread functions, spatial filtering, and holography. Prep. 3.915, *Electro-Optics II* or equivalent.

Winter quarter

3.917 Fourier Optics II

Continuation of 3.916. Prep. 3.916, *Fourier Optics I*.

Spring quarter

3.918 Experimental Optics I

Should be taken concurrently with 3.915, *Electro-Optics II*.

1 hour lecture, 2 hours laboratory.

Fall quarter

3.919 Experimental Optics II

Should be taken concurrently with 3.916, *Fourier Optics I*.

1 hour lecture, 2 hours laboratory.

Winter quarter

3.920 Experimental Optics III

Should be taken concurrently with 3.917, *Fourier Optics II*.

1 hour lecture, 2 hours laboratory.

Spring quarter

The laboratory course provides practical experience in experimental optics to supplement the theory developed in the electro- and Fourier optics lectures. Topics include: geometrical properties of lenses, aberrations, and resolution measurements; diffraction effects in optics and in lens systems; interferometric techniques applied to precise optical measurements and to image evaluation. Optical transfer function, spatial optical filtering and Fourier transformation concepts are studied in the laboratory; investigation of holographic technique and the coherence of light.

3.921 Optical Properties of Matter I — Crystals

Optics of crystals; classification and effects of crystal symmetry on optical properties; classical description of wave propagation in crystals; applications of the theory to modulation, pulse generation, non-linear optics. *Prep. 3.911, Electro-Optics I.*

Fall quarter

3.922 Optical Properties of Matter II

Introduction to electro-optical and magneto-optical effects in material media; linear and non-linear optical materials; elasto-optic and acousto-optical materials; polarization and propagation effects; modulation. *Prep. 3.921, Optical Properties of Matter I — Crystals.*

Winter quarter

3.923 Optical Properties of Matter III

Thin films and optical fibers; multilayer filters; dichroics; integrated optics. *Prep. 3.922, Optical Properties of Matter II.*

Spring quarter

3.924 Advanced Topics in Electro-Optics

Special topics in modern optics and optical techniques requiring the presentation of a paper by participants at termination of the course. *Prep. Consent of the Director of the Electro-Optics Program.* Offered by special arrangement.

Additional courses on the optics sequence are 3.980, 3.981, 3.982, 3.983, and 3.984.

3.925 Power Circuit Analysis I

Fundamental concepts of single-phase and polyphase power systems; definition of terms; use of per unit quantities; equivalent circuits of symmetrical 3-phase systems; introduction to symmetrical components; short circuits on systems with a single power source. *Prep. Bachelor of Science degree in Electrical Engineering.*

Fall quarter

3.926 Power Circuit Analysis II

This course is a continuation of 3.925, Power Circuit Analysis I. Sequence impedances of various power-system elements are considered from application point of view; unsymmetrical faults on otherwise symmetrical 3-phase systems; open conductors and asymmetrical connections and loadings; analysis of simultaneous faults on 3-phase systems; 2-phase systems. *Prep. 3.925, Power Circuit Analysis I.*

Winter quarter

3.927 Power Circuit Analysis III

This course is a continuation of 3.926, Power Circuit Analysis II. Introduction to Clarke components and applications in analysis of asymmetrical systems and faults; transmission line theory; protective relaying; fundamentals of system stability. *Prep. 3.926, Power Circuit Analysis II.*

Spring quarter

3.928 Analysis of Power Systems (4 q.h. credits)

Offered days. This course is designed to provide the basic material, including special mathematical techniques, applicable to the solution of problems associated with power systems. The sequence-impedance characteristics of various power-system elements are investigated with emphasis on application rather than design. Abnormal situations including simultaneous faults and system transients are treated in depth, making use of Clarke components and modified Clarke components as well as symmetrical components. Polyphase transmission line theory, system protection and system stability are introduced and discussed briefly. *Prep. Bachelor of Science degree in Electrical Engineering.*

Fall quarter

3.930 Power System Planning

Engineering and economic aspects underlying system development and planning. Probability methods of determining installed and spinning-reserve requirements. Mathematical models of system operation for production-costing studies. Detailed examples include economic comparison of nuclear and fossil-fuelled plants, the role of pumped-hydro generation, power pooling, and coordinated planning of interconnected systems, and the functions of high-voltage and EHV transmission in planning and operation. *Prep. 3.925, Power Circuit Analysis I.*

Spring quarter

3.931 Power System Planning (4 q.h. credits)

Offered days. Includes the material given in 3.930 but with more extensive and in-depth coverage. *Prep. 3.928, Analysis of Power Systems or equivalent.*

Spring quarter

3.932 Power Systems Protection

Consideration of protection applied to generation, transmission, and distribution. Investigation of the characteristics and operating principles of various methods of protective relaying; analysis of current techniques pertaining to system protection. *Prep. 3.927, Power Circuit Analysis III or equivalent.*

Fall quarter

3.933 Power System Transients

Transients in power systems due to system switching, lightning, or faults. Traveling-wave phenomena; insulation coordination; overvoltages due to disturbances in the system; surge protection. *Prep. 3.927, Power Circuit Analysis III or equivalent.*

Winter quarter

3.935 Computers in Power Systems I

Techniques used in solving power system problems with a digital computer. Basic concepts of matrix algebra are examined, followed by methods for the formation of incidence and network matrices; treatment of three-phase balanced and unbalanced networks in matrix form. *Prep. Bachelor of Science degree in Electrical Engineering or equivalent.*

Fall quarter

3.936 Computers in Power Systems II

Consideration of the short-circuit problem; bus impedance matrix domain, modification of bus impedance matrix for line-out, end-of-line faults, additions, removals, impedance changes; matrix reductions; features of working short-circuit programs. *Prep. 3.935, Computers in Power Systems I.*

Winter quarter

3.937 Computers in Power Systems III

The solution of simultaneous linear and non-linear algebraic equations, and

numerical techniques for solving differential equations. Digital computer application in special fields is treated, including turbine-generator control, economic dispatch and system security, and use as part of a hybrid digital-analog system.

Prep. 3.936, Computers in Power Systems II.

Spring quarter

3.938 Computer Control and Analysis of Power Systems (4 q.h. credits)

This course, offered days, combines the evening courses 3.935, 3.936, 3.937.

Prep. Bachelor of Science degree in Electrical Engineering or equivalent.

Spring quarter

3.940 Electric Machinery Theory I

Review of electromagnetic theory as applied to electrical machines; in-depth analysis of the a-c induction machine; generalized machine and d-q transformations. *Prep. Bachelor of Science degree in Electrical Engineering or 3.935, 3.976, and 3.977, Precis of Modern Electrical Engineering I, II, and III.* Fall quarter

3.941 Electric Machinery Theory II

Analysis of the principles of operation of synchronous machines with specific reference to d-qo and symmetrical components; consideration of the transient behavior of the machine. *Prep. 3.940, Electric Machinery Theory I.*

Winter quarter

3.942 Electric Machinery Theory III

Dynamic behavior of machines; comprehensive treatment of the problem of stability as applied to electric machinery. *Prep. 3.941, Electric Machinery Theory II.*

Spring quarter

3.943 Advanced Power Laboratory

Offered days. In-depth investigations of the steady-state and dynamic modes of operation of rotating machines. Polyphase rectification and control circuits. Experimentation in other related power areas. *Prep. Bachelor of Science degree in Electrical Engineering.*

All quarters

3.944 Special Topics in Power

Offered days. (Part-time students may enroll in this course only by special arrangement.) Directed reading and discussion of topics of special interest in the power field. Series of lectures by guest speakers from industry on topics of particular interest to the power student. *Prep. Permission of instructor.*

All quarters

3.945 Power System Transient Stability

Transient system models; small- and large-scale oscillations; solution of swing equation for single and multi-generator cases; load frequency and voltage controllers and transient stability. *Prep. 3.927, Power Circuit Analysis III or equivalent.*

Fall quarter

3.946 MHD Energy Conversion

Theory of operation of MHD generators; fluid mechanics; electrodynamics; channel design; magnet design; and applications. *Prep. Bachelor of Science degree in Electrical Engineering or equivalent.*

Winter quarter

3.947 High Voltage DC Power Transmission

Fundamental concepts of high-voltage DC power transmission; rectifier performance; inverter performance; method of regulation; protection; reactive power and filter requirements. *Prep. 3.927, Power Circuit Analysis III or equivalent.*

Spring quarter

3.950 Systems Analysis I-A

Review of probability and statistics. Elements of Markov processes, queuing as a Markov process. Finite and infinite queue systems, multiple-server, parallel and sequential queuing; fundamentals of reliability theory. *Prep. Bachelor of Science degree in Engineering or Science.* Fall quarter

3.951 Systems Analysis I-B

Flow-graph representation of queuing systems, equivalence of flow-graph and analog-computer representation; fundamental concepts in game theory; solution of rectangular games; pure and mixed strategies, maximin and minimax principle; zero and non-zero-sum games, infinite games; transformation of games into linear programming problems. Other methods of solving competitive-situation problems. *Prep. 3.950, Systems Analysis I-A.* Winter quarter

3.952 Systems Analysis II

Modelling of systems problems in terms of linear programming approach. Transportation problem; graphical representation and solution of linear-programming problems; allocation problem; simplex method; concept of duality and its use in linear programming. *Prep. 10.8A4, Advanced Mathematics or 10.9N2, Advanced Mathematics.* Spring quarter

3.953 Systems Analysis III

Optimization of stochastic systems. Markov-process approach to the analysis of probabilistic systems. Z-transform analysis of Markov processes. Solution of sequential decision processes by value and policy iteration. Single-chain and multi-chain systems. Sequential decision processes with discounting. Machinery and car replacement problem, and other applications. *Prep. 3.950, Systems Analysis I-A, 3.952, Systems Analysis II, 10.8G1, Probability or equivalent.* Fall quarter

3.954 Systems Analysis (4 q.h. credits)

Offered days. Includes the material given in 3.950 and 3.951 — Systems Analysis A and I-B. *Prep. Bachelor of Science degree in Engineering or Science.* Spring quarter

3.957 Control System Analysis

Classical analysis techniques for continuous and sampled-data control systems. Discussion of stability criteria; application of root-locus and Bode methods for complementary time and frequency-domain analysis. Consideration of nonlinear systems and development of techniques for stability analysis. Computer simulation of typical control systems will be emphasized. *Prep. Bachelor of Science degree in Engineering; knowledge of transform analysis and some familiarity with FORTRAN.* Fall quarter

3.958 Control System Synthesis

Review of cascade and feedback compensation techniques with the use of classical criteria for design of continuous and sampled-data control systems. Consideration of the multiple-input problem. A survey of pole-zero synthesis methods, and comparison with other techniques. Computer simulation of design examples. *Prep. 3.957 Control System Analysis or equivalent.* Winter quarter

3.959 Control Systems I (4 q.h. credits)

Includes the material given in 3.957, Control System Analysis and 3.958, Con-

trol System Synthesis. Open to qualified undergraduate students. Prep. Knowledge of transform analysis and some familiarity with FORTRAN. Fall quart

3.960 Control System Practice

A further study of control systems with emphasis on the practical aspects of control system design. Discussion of digital compensation and computer-in-the-loop realizations. Consideration of system hardware and software problems. Case studies and a field trip will be included. Prep. 3.959 *Control Systems I or equivalent.* Spring quart

3.961 Optimal Control Theory

Introduction to optimal control theory with reference to aerospace and process control applications. Variational calculus development of the maximum principle. Numerical solutions using dynamic-programming and steepest-descent algorithms. The optimal linear regulator problem and the matrix Riccati equation. Prep. 3.959 *Control Systems I or equivalent.* Fall quart

3.962 Control Systems II (4 q.h. credits)

Includes the material given in 3.960, Control System Practice and 3.961, Optimal Control Theory. Prep. 3.959, *Control Systems I or equivalent.* Winter quart

3.963 Stochastic Control Theory

Statistical models for random signals; representation of dynamic systems excited by stochastic inputs. Optimal filtering, prediction and smoothing for discrete and continuous systems. Observer theory and feedback of estimated states for effective closed-loop control in a noisy environment. Prep. 3.900, *Applied Probability and Stochastic Processes A or equivalent.* Winter quart

3.964 Estimation, Identification, and Control

Estimation theory for dynamic systems based on Bayesian and maximum likelihood methods. The system identification problem. Implementation of numerical algorithms for parameter identification and adaptive control. Prep. 3.900, *Stochastic Control Theory.* Spring quart

3.965 Control Systems III

Includes the material given in 3.963, Stochastic Control Theory and 3.964, Estimation, Identification, and Control. Prep. 3.900, *Applied Probability and Stochastic Processes A or equivalent.* Spring quart

3.967 Switching Circuits I

Logical design of combinational switching circuits, including minimization and decomposition of switching functions; multiple output networks; symmetric networks; threshold logic. Prep. Bachelor of Science degree in Engineering Science. Fall quart

3.968 Switching Circuits II

Logical design of sequential switching circuits, including the finite-state machine model; iterative networks; capabilities and limitations of finite-state machines; state equivalence; synthesis of asynchronous sequential circuits; state assignment problem and partition theory; machine decomposition. Prep. 3.967, *Switching Circuits I.* Winter quart

3.969 Switching Circuits III

Selected topics from the theory of finite automata, possibly including such topics as

as machine experiments; information lossless machines; linear sequential machines; finite-state recognizers. Prep. 3.968, *Switching Circuits II and Linear Algebra background such as covered in 3.823, Math Methods in Electrical Engineering.*

Spring quarter

3.972 Electronic Digital Computers I

Basic structural aspects and components; coding of digital information; fixed and floating point digital arithmetic and algorithms; speed-up algorithms in binary and alternative codes; switching functions, Boolean logic and minimizations; linear, sequential synchronous, and asynchronous — including simple and multiple output circuits; central processor design examples. Prep. Bachelor of Science degree in Engineering or Science.

Fall quarter

3.973 Electronic Digital Computers II

Computer description languages; elementary machines and computer organizations; memories; hierarchies; essential features of automatic programming; addressing techniques, cycle times, operating speed, and cost/bit comparisons; special function memories; structural design of a general purpose computer; instruction formats and repertoires, program sequencing, control of data, and instruction flow; execution of several types of instructions; software and hardware interaction. Prep. 3.972 *Electronic Digital Computers I.*

Winter quarter.

3.974 Electronic Digital Computers III

Computer design considerations in different types of logic families and devices e., DDL, DTL, TTL, etc.; digital system designs using medium and large scale integration; control logic, hybrid computers; basic simulation studies of physical and digital systems; interaction between computer memories, central processing units and peripheral equipment. Prep. 3.973 *Electronic Dig. Comp. II*

Spring quarter

975 Precis of Modern Electrical Engineering I

rep. Bachelor of Science degree in Engineering or Science plus knowledge of matrix algebra.

Fall quarter

976 Precis of Modern Electrical Engineering II

rep. Bachelor of Science degree in Engineering or Science. Winter quarter

977 Precis of Modern Electrical Engineering III

rep. Bachelor of Science degree in Engineering or Science. Spring quarter

978 Precis of Modern Electrical Engineering IV

rep. Bachelor of Science degree in Electrical Engineering or Science. Spring quarter

The preceding four precis courses are intended primarily for those whose undergraduate major was in an engineering or scientific field other than electrical engineering. They are also recommended for students 5 to 10 years away from their bachelor's degree in electrical engineering who feel the need for a review of electrical science. They are open only to students in these categories. The material is basically undergraduate in nature but the viewpoint and depth are at the mature level appropriate to graduate students. Part I deals with the theory of electric circuits and linear systems, Part II with electronics, Part III

with field theory from the engineering viewpoint, and Part IV with communication theory especially spectral analysis correlation and modulation.

3.979 Electronic Digital Computers (4 q.h. credits)

This course, offered days, embodies the material in 3.972 and 3.973 — Electronic Digital Computers I and II. *Prep. Bachelor of Science degree in Engineering or Science.*

Fall and winter quarter

3.980 Optical Instrumentation Design Concepts

An introduction to the design of optical instrumentation. Principles and basic concepts rather than a rundown of known optical systems. In sequence the topics are: introduction, mechanical shock and vibration, kinematic designs, application of third order aberrations, simple optical ray tracing, optical testing tolerances, optical instrumentation, philosophy, functional design, design for quantity production, quality assurance, "special order" design, industrial design examples and exercises. *Prep. 3.915, Electro-Optics II.*

Spring quarter

3.981 Principles of Optical Detection I — Application

Laws governing radiation and radiometry; properties of real radiation sources detailed description of detection devices (image forming and signal generating), noise; contrast and MTF; detection systems (imaging devices and ranging devices); electro-optical detector systems analysis. *Prep. 3.915, Electro-Optics or equivalent.*

Winter quarter

3.982 Principles of Optical Detection II — Theory

Review of detector parameters; statistics of detector noise; practical considerations in real detectors; detection, resolution and recognition of signals; heterodyne detection and parametric amplification; sub-nanosecond pulse detection; calibration of electro-optical detectors; detectors as system components. *Prep. 3.981, Principles of Optical Detection I.*

Spring quarter

3.983 Fourier Optics III

The third in a series covering current topics of interest in this field and optical instrumentation. Application of coherence phenomena to optical instrumentation such as microdensitometers, microscopes, viewers, cameras, spectrophotometers and interferometric instruments; applications of holography, optical data processing and computing, holographic memories, optical modulation, noise and its effects on data collection, synthetic aperture optics and medical applications of laser optics. *Prep. 3.917, Fourier Optics II.*

Fall quarter

3.984 Spectroscopic Instrumentation

Survey of optical instrumentation employed in analysis and control situations modern methods of spectrometry and interferometry; optimization of analytic systems; topics in electron spectroscopy, X-ray spectroscopy, microwave spectroscopy, and related fields. *Prep. Bachelor of Science degree in Engineering or Science.*

Winter quarter

3.985 Fundamentals of Automatic Digital Computation I — Language Mode

Review of sets, relations, and graphs. Overview of compiling — lexical, syntactic, and semantic aspects. Languages as sets of strings; grammars as finite descriptions; the hierarchy of grammar types; deterministic and nondeterministic recognizers. Regular languages and regular expressions. Algebraic operations, equational characterization, closure properties, and equivalence relation

Context-free grammars and block-structured programming languages. Defining equations, normal forms, construction of recognizers from pushdown automata. Ambiguity, determinism, closure properties. *Prep. 3.983 Digital Computer Programming I.* Fall quarter

986 Fundamentals of Automatic Digital Computation II — Translation
 Syntax-directed translation schemas for context-free languages. Extended regular expressions for lexical analyzers. Earley's algorithm for nondeterministic grammars. DeRemer's algorithm for deterministic bottom-up parsing. Recursive functions of regular expressions for top-down translation. Virtual machine techniques for intermediate language interpretation. *Prep. 3.985 Fundamentals of Automatic Digital Computation I.* Winter quarter

987 Fundamentals of Automatic Digital Computation III — Computability
 Review of algorithms and procedures. Turing machine construction techniques. Universal machines and the halting problem. Equivalence to Type 0 grammars. Solvable and unsolvable problems. Computable numbers and arithmetization of turing machines. Recursive functions and conditional expressions. Introduction to structured program validation techniques. *Prep. 3.985 Fundamentals of Automatic Digital Computation I.* Spring quarter

988 Special Topics in Computer Science
 Aspects of Computer Science not covered in other courses. The subject matter may change from year to year. Fall, winter, and spring quarters

989 Computer Peripherals
 Survey of various types of modern computer peripherals, systems considerations, displays (CRT; control units, editing features, graphics, etc.); mass storage magnetic surfaces; flying heads, recording techniques, disks; file organization, search strategies, mass storage, software, etc.); communications terminals (modems, control procedures, store and forward, multiplexers, etc.); tape units (types, consideration of cost vs. performance, tape labels and formats, magnetic coding on tapes, design features, etc.); future trends in peripherals. *Prep. Bachelor of Science degree in Electrical Engineering or related engineering or sciences.* Spring quarter

990 Seminar I
 Library survey of a selected topic in the general field of electrical engineering with an oral presentation based on this survey. Participation in the departmental seminar program of guest lecturers. *Prep. Bachelor of Science degree in Engineering or Science.* Fall and spring quarters

991 Seminar II
 The preparation of a research paper suitable for publication in a professional journal, plus an oral presentation of this report. *Prep. 3.990, Seminar I.* Winter and spring quarters

993 Doctoral Seminar I
 Two hours per week of presentation and discussion of topics at a level compatible with a doctoral program. Subject matter may cover a wide range of scientific and engineering fields. (Only S or F grades will be assigned for this course.) *Prep. Passing of Ph.D. Qualifying Exam.* Fall quarter

3.994 Doctoral Seminar II

Continuation of 3.993, Doctoral Seminar I. (Only S or F grades will be assigned for this course.) *Prep. 3.993, Doctoral Seminar I.* Winter quarter

3.995 Master's Thesis

Analytical and/or experimental work conducted under the auspices of the department. *Prep. Bachelor of Science degree in Engineering or Science.*

Fall, winter, and spring quarter

3.996 Doctoral Thesis

Theoretical and/or experimental work conducted under the auspices of the department. *Prep. Passing of Ph.D. Qualifying Exam.*

Fall, winter, and spring quarter

3.997 Doctoral Reading

Material approved by the candidate's adviser. (Only S or F grades will be assigned for this course.) *Prep. Passing of Ph.D. Qualifying Exam.*

Fall, winter, and spring quarter

3.998 Special Problems in Electrical Engineering

Theoretical or experimental work under individual faculty supervision. *Pre. Consent of dept. chairman.* Fall, winter, and spring quarter

3.999 Electrical Engineer Degree Thesis Research. *Prep. Admission to Engineer Degree Program.* Fall, winter, and spring quarter

CHEMICAL ENGINEERING

4.801 Advanced Chemical Engineering Calculations (4 q.h. credits)

The study of complex material and energy balances is undertaken with the view to apply these to actual plant conditions. *Prep. Bachelor of Science degree Chemical Engineering, including Differential Equations.*

4.802 Special Topics in Chemical Engineering Mathematics (4 q.h. credits)

Formulation and solution of problems involving advanced calculus as they arise in chemical engineering situations. Methods covered will include ordinary differential equations, series solutions, complex variables, Laplace transform, partial differential equations, and matrix operations. Emphasis will be placed on methods for formulating the problems. It will be assumed that the student has been exposed to some of these topics in appropriate mathematics course. *Prep. 10.147 Mathematical Analysis or equivalent.* Offered yearly, fall quarter

4.803 Numerical Techniques in Chemical Engineering (4 q.h. credits)

Digital computer applications to chemical engineering problems. Topics covered include location of roots of linear and non-linear equations, numerical integration, and curve-fitting techniques with emphasis on the numerical solution of ordinary and partial differential equations and to the subject of linear algebra. *Prep. Bachelor of Science degree in Engineering or Science.*

Offered yearly, winter quarter

4.806 Optimization Techniques (4 q.h. credits)

Several mathematical optimization techniques are developed and applied to chemical engineering problems. Emphasis on a thorough understanding of

ingle, representative technique selected from among many within its class. Topics include single variable search (Fibonocicci Search), multi-dimensional search (Pattern Search), linear systems (Linear Programming) and sequential operations (Dynamic Programming). *Prep. Bachelor of Science degree in Engineering or Science.* Offered yearly, spring quarter

.811 Special Topics in Chemical Engineering Thermodynamics (4 q.h. credits)
Classical thermodynamics as a method of approach to the analysis of processes of interest to chemical engineers. A study of chemical and phase equilibria involving the various states of matter; prediction and correlation of physical, chemical, and transport properties of gases and liquids; elementary concepts of quantum and statistical mechanics to interpret the empirical properties of classical thermodynamics. Fundamental principles are reviewed to the extent needed. *Prep. Undergraduate Chemical Engineering Thermodynamics.*

Offered yearly, winter quarter

.821 Corrosion Fundamentals (2 q.h. credits)
Economic factors, basic theories, types, behaviors of specific systems, and protection against corrosion are studied. Wherever possible, engineering applications of the principles are emphasized. *Prep. Bachelor of Science degree.*

.823 Transport Phenomena (4 q.h. credits)
Consideration of the relationships of mass, momentum, and energy transfer. Fundamental equations of change covering the transport of momentum, heat, and mass are developed to illustrate the essential unity of the transport processes. Molecular, microscopic, and macroscopic systems are studied. It will be seen that much of the theory behind the engineering calculations on which the unit operations of chemical engineering are based can be organized and integrated in terms of equations of change. *Prep. Advanced Mathematics and Unit Operations or equivalent.* Offered yearly, winter quarter

.825 Sampled-Data Process Control (2 q.h. credits)
Signal sampling; z-transformation; pulse transfer functions; open and closed loop systems; stability; frequency and z-domain design methods. *Prep. Undergraduate Process Control or permission.*

.826 Experiments in Process Control (2 q.h. credits)
Laboratory experiments related to controllers, control valves, transmitters, attainment of process dynamics by various methods, and control loop performance are performed and analyzed. *Prep. Undergraduate Process Control or permission.*

.827 Chemical Process Control I (2 q.h. credits)
Review of classical control techniques; state variable representation and analysis of continuous systems with applications to process control. *Prep. Undergraduate Process Control or permission.*

.828 Chemical Process Control II (2 q.h. credits)
Frequency domain process dynamics and control system analysis; feedforward and cascade control applications; associated papers from the chemical engineering literature. *Prep. 4.827 Chemical Process Control I or permission.*

4.829 Special Topics in Chemical Process Control (4 q.h. credits)

Review of classical control techniques; state variable representation and analysis of continuous systems with applications to process control. Frequency domain process dynamics and control system analysis; feedforward and cascade control applications; associated papers from the chemical engineering literature. *Prep. Undergraduate Process Control or permission.*

4.830 Advanced Topics in Chemical Process Control (4 q.h. credits)

Topics related to the analysis and synthesis of sampled-data process control systems; associated papers from the chemical engineering literature. *Prep. 4.829 Special Topics in Chemical Process Control or permission.*

4.832 Chemical Data Estimation (2 q.h. credits)

Methods of obtaining physical and thermodynamic properties of chemical compounds and systems without resorting to laboratory investigation. Latest empirical relationships and physical and thermodynamic laws are introduced to obtain data for plant design and other chemical and engineering uses. *Prep. Bachelor of Science degree.*

4.833 Research Techniques I (4 q.h. credits)

The essential techniques of research including experimentation, mathematical modeling, data reduction, and graphical presentation techniques. For students in the non-research options (M.S. and D.Eng.). *Prep. Bachelor of Science degree and registration in non-thesis M.S. or D.Eng. program.* Offered yearly, all quarters.

4.834 Research Techniques II (4 q.h. credits)

Continuation of 4.833. *Prep. 4.833.* Offered yearly, all quarters.

4.835 Analytical and Numerical Techniques (4 q.h. credits)

For students interested in solving comprehensive problems using computer methods. Problems solved in the course will be based on the interest of the students and staff and will be individual. *Prep. Bachelor of Science degree and knowledge of digital computer programming.*

4.840 Advanced Management Techniques in the Chemical Industry (4 q.h. credits)

Management techniques applied to the chemical industry. Special attention to management of research organizations and to management of engineering services, such as design, computer, and related activities. *Prep. Graduate standing.* Offered yearly, winter quarter.

4.845 Advanced Plant Design Concepts (4 q.h. credits)

Modern approaches to plant design; computer-oriented design, analysis and simulation of chemical processes, use of strategy decision making in design, advanced scheduling and planning techniques. *Prep. Undergraduate plant design course, knowledge of digital computer programming.*

Offered yearly, spring quarter.

4.850 Chemical Process Pollution Control (Water) (4 q.h. credits)

Provides chemical engineering students with basic fundamentals for handling environmental problems in the chemical process industries. Water quality requirements and industrial waste characteristics; wastewater treatment processes applicable to environmental engineering; biological treatment processes and equipment; comprehensive design problems involving biological and tertiary

treatment; the economics of water treatment and reuse. *Prep. Graduate standing in Chemical Engineering. Open to selected ChE seniors.*

Offered 1974-75, spring quarter

4.860 The Energy Crisis: A Survey (2 q.h. credits)

The energy resources of the United States in comparison to the projected demands upon them over the next two decades. Energy sources alternative to fossil fuels such as: nuclear power, hydropower, geothermal and solar power are discussed with regard to the feasibility of their extensive application by the year 2000. Focus upon technical requirements, and economic and environmental impact. *Prep. Bachelor of Science degree.*

4.861 The Energy Crisis: Fuel to Fuel Conversion (2 q.h. credits)

Energy problems associated with the oil, gas, and coal industries. The relative merits of various processes for converting one fuel to another, including the gasification of coal to produce either a low-BTU gas or pipeline quality gas. Production of oil from oil shale, coal, and tar sands. *Prep. Bachelor of Science degree.*

4.862 The Energy Crisis: Solar Energy (2 q.h. credits)

The role of solar energy as a future energy resource in relation to its present state of development. The characteristics of solar radiation and methods of collecting, storing and converting the energy. Emphasis on documented technical and economic experience with solar energy reported in the literature. Current research proposals aimed at harnessing the sun's energy. *Prep. Bachelor of Science degree.*

4.890 Seminar in Chemical Reactor Analysis (4 q.h. credits)

Effects of fluid mixing, temperature and reaction rate model on the performance of chemical reactors. Specific topics covered are macro- and micromixing in homogeneous media, boundary conditions for tubular flow reactors, stability of non-isothermal reactors, optimal reactor performance and radical polymerization. *Prep. Thermodynamics, undergraduate Chemical Engineering Kinetics or equivalent.* Offered yearly, winter quarter

4.891 Selected Topics in Kinetics of Chemical Processes (4 q.h. credits)

Theoretical foundations are developed for the investigation and rationalization of chemical reaction rates. Rate theories regarding elementary steps; sequential reactions using the steady-state approximation; correlations of homogeneous and heterogeneous catalysis; matrix methods applied to the analysis of reaction networks. *Prep. Undergraduate Thermodynamics.* Offered yearly, fall quarter

4.899 Special Topics in Chemical Engineering (4 q.h. credits)

Topics of interest to the staff member conducting this class are presented for advanced study. A student may not take more than one Special Topics course with any one instructor. *Prep. Permission of department staff.*

Offered yearly, all quarters

I.973 Special Topics in Chemical Process Heat Transfer (4 q.h. credits)

Empirical methods and calculations used to design heat transfer equipment for the chemical process industries. Review of basic heat transfer principles. Shell-and-tube calculations for liquid and/or vapor phase heat transfer. Direct contact and other special heat exchanger applications. *Prep. Undergraduate Heat Transfer.*

4.974 Selected Topics in Fluid Mechanics (4 q.h. credits)

Discussion of statics, kinematics, and stress concepts associated with fluids. Formulation of the general equations of motion with application to laminar and turbulent flow. Topics on boundary layer theory and compressible flow are included. *Prep. Undergraduate Fluid Mechanics.*

Offered yearly, winter quarter

4.990 Seminar

Topics of an advanced nature are presented by staff, outside speakers, and students in the graduate program. This course must be attended by all master's degree candidates. *Prep. Admission to graduate program in Chemical Engineering.*

Offered yearly, all quarters

4.991 Thesis (Master's Degree)

Analytical and/or experimental work conducted under the supervision of the department. For master's degree requirement. *Prep. Admission to Master of Science program in Chemical Engineering.*

Offered yearly, all quarters

4.995 Thesis (Ph.D. Degree)

Theoretical and experimental work conducted under the supervision of the department. *Prep. Admission to doctoral program in Chemical Engineering.*

Offered yearly, all quarters

4.996 Thesis (D. Eng. Degree)

Theoretical and experimental work conducted under the supervision of the department. *Prep. Admission to doctoral program in Chemical Engineering.*

Offered yearly, all quarters

INDUSTRIAL ENGINEERING AND ENGINEERING MANAGEMENT

5.801 Analysis of the Industrial Enterprise I

A background for the practicing engineer, covering the various phases of operation within the industrial enterprise; history and growth; management selection and development; labor-management relations; product development and marketing; public relations and the corporate image. *Prep. Bachelor of Science degree in Engineering or Science.*

Offered yearly, all quarters

5.802 Analysis of the Industrial Enterprise II

The environment in which the industrial enterprise operates; modern planning and forecasting; meeting the technological advance; financial aspects within and without the company; the effect of the economic climate; community and government influences. *Prep. 5.801 Analysis of the Industrial Enterprise I.*

Offered yearly, all quarters

5.803 Industrial Organizations

An analysis of the purpose and functioning of organizations as the basic networks for goal satisfaction through coordination of effort, communication, and responsibility. The approach will be based on modern behavioral science concepts. *Prep. Admission to Program.*

Offered yearly, days only, fall quarter

5.805 Industrial Budgeting for Engineers

Budgeting plans, programs, and reports for industry today; an introduction to

the essentials of fixed and variable budgeting for production, inventory, sales, cash, capital, and cost-volume-profit analysis. *Prep. 5.810, Industrial Accounting or equivalent.* Offered yearly, fall quarter

5.806 Production Forecasting

Econometric methods of forecasting the demand for industrial products; emphasis on techniques applicable to individual companies and the total demand. The principal tool used is the mathematical model of the causal factors with special attention to determining the reliability of the model. *Prep. 5.951, Engineering Statistics II or equivalent.* Offered yearly, fall quarter

5.808 Basic Engineering Economy

Economic analysis in formulating business policies and selecting alternatives from possible engineering solutions to industrial problems, present worth, annual cost, and rate of return techniques with continuous and discrete interest calculations. *Prep. Bachelor of Science degree in Engineering or Science.* Offered yearly, all quarters

5.809 Advanced Engineering Economy

Principal emphasis on the practical application of the techniques studied in basic engineering economy; problems of implementation through class discussion of cases and a major term project; recent advances in the techniques of engineering economy, especially those relating to the consideration of uncertainties. *Prep. 5.808, Basic Engineering Economy or equivalent.* Offered yearly, fall and winter quarters

5.810 Industrial Accounting for Engineers

Introduction of basic accounting principles and procedures; use of accounting data as a management tool; a practical coverage of basic cost procedures related to materials, labor, and manufacturing expense cost control; job order, process, and standard cost systems. *Prep. Bachelor of Science degree in Engineering or Science.* Offered yearly, all quarters

5.811 Cost Accounting for Engineers

Cost accounting procedures as established by accountants are studied and evaluated in terms of being considered by the engineer for cost determination of alternative engineering proposals. *Prep. 5.810, Industrial Accounting or equivalent.* Offered yearly, winter quarter

5.812 Management of Technical Innovation

Analysis of the particular problems of managing research, development and engineering based on current developments in general management theory and the behavioral sciences; technical innovation as part of the overall organization; class discussion of cases and student term papers. *Prep. Bachelor of Science degree in Engineering or Science.* Offered yearly, fall and winter quarters

5.813 Engineering Communication

Exploration of practice in the effective preparation and presentation both written and oral, of the results of engineering projects and programs as a basis for business decisions: including formal reports, progress summaries, memoranda, and technical papers. The effective use of various media and audio visual aids based on both audience and material. Consideration of the types of audiences frequency encountered and their needs and reactions as factors in selecting approach.

5.814 Development of Engineering Managers

Analysis of the problems faced by the engineer in the transition from individual contributor to engineering manager; the challenge of engineering management analyzing what is their business and who are their customers; integrating profession and management objectives; developing guides for engineering managers, enabling them to examine their own work and performance, to diagnose their weaknesses, and to improve their effectiveness as well as the results of the enterprise. *Prep. 5.801, Analysis of the Industrial Enterprise I.*

Offered yearly, all quarters

5.815 Legal Aspects of New Technology

The relationship of laws and regulations to technical innovation and related corporate activities; emphasis on the patent and copyright systems; trade secrets; managing intellectual property as part of employer-employee relations disposition of rights under federal contracts and grants. *Prep. Bachelor of Science degree in Engineering or Science.*

Offered yearly, fall and spring quarters

5.816 Industrial Psychology for Engineers

A general coverage of the application of psychology to industry with emphasis on industrial environments and organization, human relations, group dynamics tests and measurements, personnel practices, training, and motivation. *Prep. Bachelor of Science degree in Engineering or Science.*

Offered yearly, all quarters

5.817 Advanced Work Design

Basic philosophies of work design; implementation of work design concepts with case studies; study and analysis of models such as work sampling, sequence or flow of work models; repetitive and nonrepetitive work models, and work measurement models such as standard data; human factors in measuring operator performance; regression analysis approaches; emphasis on development of professional, analytical, and managerial skills and abilities at a systems level. *Prep. Bachelor of Science degree in Engineering or Science.*

Offered yearly, spring quarter

5.819 Human Factors in Man-Machine Systems

Design of equipment and systems for human use; emphasis on the application of engineering psychology; visual and auditory presentation of information—speech communications, man-machine dynamics, design of controls, layout of work places, and environmental effects on human performance. *Prep. Bachelor of Science degree in Engineering or Science.*

Offered yearly, all quarters

5.820 Personnel Administration for Engineers

Personnel programs for attracting and retaining technical talent; evaluating effectiveness of major personnel policies; modern methods of salary and wage administration; planning profitable relationships among company, supervisors and employees. *Prep. Bachelor of Science degree in Engineering or Science.*

Offered yearly, winter and spring quarters

5.822 Product Design and Value Analysis

Study of design parameters and their effect on development, manufacturing and procurement; functional analysis of components and systems; complete projects and case studies are integrated in the course. *Prep. Bachelor of Science degree in Engineering or Science.*

Offered yearly, winter and spring quarters

5.823 Advanced Production Analysis (4 q.h. credits)

Study of advanced problem-solving techniques in the areas of method and measurement, layout and facilities planning, material handling and manufacturing processes. Case studies and a course project in a local concern illustrate the concepts presented. *Prep. Bachelor of Science degree in Engineering or Science.* Offered yearly, days only, fall quarter

5.824 Case Studies in Industrial Engineering

Formulation of problems and analysis of situations on topics such as: work measurement, line balancing, plant layout, regression analysis, wage and salary administration, management information systems and network analysis. Class discussion and written analysis of a variety of cases is included. *Prep. 5.823, Advanced Production Analysis.* Offered yearly, days only, spring quarter

5.825 Topics in Production Engineering

Production problems to include: line balancing, plant location, plant layout and material handling, design of manufacturing systems, job sequencing. Course utilizes readings, projects and case studies. (Not open to those who have taken 5.823, Advanced Production Analysis) *Prep. Bachelor of Science degree in Engineering or Science.* Offered yearly, winter quarter

530 Financial Management I

Study of the issues and processes of short-term financing of industrial firms; financial analysis of cases, supplemented by readings to develop familiarity with sources and uses of working capital as well as the goals and problems involved in its management. (Open to Engineering Management majors only.) *Prep. 5.801, Analysis of the Industrial Enterprise I, and 5.810, Industrial Accounting for Engineers, and 5.808, Basic Engineering Economy or equivalent.*

Offered yearly, all quarters

531 Financial Management II

Extension of Financial Management I with emphasis on analysis necessary to such long-term financial decisions as issuance of stock or bonds; contracting leases or loans, and financing of a new enterprise; mergers, capital budgeting, the cost of capital, and the valuation of a business. *Prep. 5.830, Financial Management I.*

Offered yearly, all quarters

540 Seminar on Management of Engineers

Each student will prepare a term project on a subject of his choosing to be presented orally and in writing; discussions of major problem areas led by instructor and guest speakers. (Limited to 15 students selected from pre-registration applications.) *Prep. 5.812 or 5.814 or 5.816 or 5.820.*

Offered yearly, spring quarter

541 Engineering Project Administration

Study of the problems of coordinating human, technical, and financial resources in initiating, conducting, and completing major technical projects; planning, organizing, staffing, directing, and controlling using modern concepts and techniques; scheduling, budgeting, communicating; coping with uncertainty and probability; analysis of typical cases. *Prep. Bachelor of Science degree in Engineering or Science.*

Offered yearly, fall and spring quarters

560 Health Care Organization and Management

Story of the development and the delivery of health services; health organization

tion functions and inter-relationships of health-oriented organizations; study certain legal principles and rulings of importance to medical personnel; introduction to interpersonal ethics of patient care. *Prep. Admission to the Graduate School of Engineering.*

Offered yearly, fall quarter

5.862 Introduction to Occupational Health and Safety

Accident prevention, accident cost analysis, Federal and local legislation, record-keeping requirements under OSHA Act of 1970; occupational safety and health standards, safety programs and inspections, fire prevention and control methods; human behavior and industrial safety, occupational diseases and personnel protective equipment. *Prep. Bachelor of Science degree in Engineering or Science.*

Offered yearly, fall quarter

5.863 Technical Aspects of Health and Safety

Safety responsibilities of management and employees; methods of hazard control; accident investigation; recognition of chemical, electrical and mechanical hazards; principles of machine guarding; occupational safety and health standards, safety training; toxicology and first aid and medical services. *Prep. 5.862 Introduction to Occupational Health and Safety or permission of the instructor.*

Offered yearly, winter quarter

5.864 Topics in Physiology and Biomedical Engineering

Introduction to specific areas relating to human structure and function, and the use of engineering techniques for medical diagnosis and therapy. Areas considered include blood and blood components, the cardiovascular system, the kidney and urinary systems and respiratory systems. The course will be taught on a seminar basis. Students will be required to do literature research under the guidance of the instructor. *Prep. permission of instructor.*

Offered yearly, spring quarter

5.865 Case Studies in Health Systems

Readings and discussion of case histories of application of systems analysis to field of health. Outstanding administrators and systems analysts from various health organizations will be invited to speak to class. *Prep. Admission to the Graduate School of Engineering.*

Offered yearly, spring quarter

5.900 Basic Operations Research (4 q.h. credits)

An introduction to the theory and use of deterministic and stochastic models to represent industrial operations. Models included are those of linear programming, dynamic programming, inventory control, waiting lines, and Monte Carlo simulation. Embodies the material in 5.901 and 5.902, Basic Operations Research I and II. Open to both day and evening students. *Prep. 5.951, Engineering Statistics II or 10.8G1, Probability.*

Offered yearly, fall quarter

5.901 Basic Operations Research I

Introduction to the theory and use of deterministic models to represent industrial operations; includes linear programming, dynamic programming, networks, and game theory. *Prep. Bachelor of Science degree in Engineering or Science.*

Offered yearly, all quarters

5.902 Basic Operations Research II

Introduction to the theory and use of stochastic models to represent industrial operations; includes queuing, inventory, and Markovian models. *Prep. 5.900 Basic Operations Research I and 5.951, Engineering Statistics II or equivalent.*

Offered yearly, all quarters

5.903 Inventory Control and Production Planning

The design and operation of inventory systems from a scientific management point of view, including both required theory and practical aspects. Subjects include inventory control models, statistical forecasting, production scheduling techniques, distribution systems, management control and reports, discussion of actual systems, and a case study. *Prep. 5.951, Engineering Statistics II or equivalent.* Offered yearly, spring quarter

5.904 Queuing Theory and Its Applications

A development of the theory of queues using the equations of detailed balance approach; study of models based on random arrivals including exponential and Erlang service distributions, single and multiple services, series and parallel systems, and finite and infinite queues, applications to staffing, inventory control, maintenance, and scheduling. *Prep. 5.900 or 5.902, Basic Operations Research* Offered yearly, winter quarter

5.905 Analysis with Simulation

Model building for digital simulation, testing and validation of models, simulation compiler languages, logic flow charting, applications drawn from economics, scheduling, inventory problems, marketing, and others; programming and running of several models. *Prep. 5.913, Data Processing for Engineers and 5.951, Engineering Statistics II or equivalent.* Offered yearly, winter quarter

5.906 Principles of Dynamic Systems I

Introduction to modeling of social systems, emphasizing the study of feedback structures and their behavior; development of concepts that allow one to understand the mechanisms underlying growth, stagnation and cyclical fluctuation; examples and practice at formulating models of industrial, economic, social, and ecological systems; study of some of the effects of delays, multiple feedback loops, and non-linearities; aim to building an intuitive foundation for simulation studies of complex systems. *Prep. Bachelor of Science degree in Engineering or Science.* Offered yearly, fall quarter

5.907 Principles of Dynamic Systems II

Continuation of topics from 5.906 with increased experience in the construction and analysis of generic feedback structures; examination of current and previous System Dynamics applications including Urban Dynamics and World Dynamics; exercises in model conceptualization. *Prep. 5.906, Principles of Dynamic Systems I.* Offered yearly, winter quarter

5.908 Principles of Dynamic Systems III

Treatment of the process and problems of application and implementation of System Dynamics. Individual student modeling projects using System Dynamics. *Prep. 5.907, Principles of Dynamic Systems II.* Offered yearly, spring quarter

5.909 Systems Engineering and Analysis

Methods of describing, analyzing, and manipulating complex systems both open and closed loop; meaning of system optimization; classical optimization techniques; emphasis on the description and design of a system rather than system manipulation and on "complete" system rather than submanipulation; examples drawn from transportation, information, manufacturing, etc. *Prep. Admission to the Program.* Offered yearly, days only, winter quarter

5.910 Analytical Techniques for Engineers

Linear algebra, transform techniques including Laplace transforms and z transform; systems of linear differential equations. *Prep. Bachelor of Science degree in Engineering or Science.* Offered yearly, fall quarter

5.911 Linear Programming

Covers in-depth techniques and theory contained in linear, quadratic, and non-linear programming which would include sensitivity analysis, the dual theorem, parametric programming, and problems involving uncertainty. *Prep. 5.900 or 5.902, Basic Operations Research or equivalent and a course in linear algebra.*

Offered yearly, spring quarter

5.912 Network Planning and Control

Applications of the theory of flow through networks to scheduling, planning, line balancing, transportation, and materials handling; PERT and Critical Path Scheduling; case studies of successful and unsuccessful applications; computer and manual solutions utilized. *Prep. 5.913, Data Processing for Engineers or equivalent.*

Offered yearly, spring quarter

5.913 Data Processing for Engineers

Open only to students who have not had a basic course or extensive experience in a compiler language. A study of digital computers and computer programming techniques as applied to management problems. The course will cover the basic characteristics and operation of computing equipment and peripheral devices. The FORTRAN language is presented in depth and will be utilized by the student for programming and running several projects on a computer. Other compiler languages will be described and compared to FORTRAN. A systems approach to the design, development, and implementation of computer programs for solving management problems will be emphasized. Examples will be studied from several management areas. *Prep. Bachelor of Science degree in Engineering or Science.*

Offered yearly, all quarters

5.914 Advanced Operations Research (4 q.h. credits)

Further study of quantitative techniques available to assist management scientific decision-making, including Markov processes, utility theory, Bayesian statistics, and forecasting; case studies of real industrial problems. *Prep. 5.902, Basic Operations Research.*

Offered yearly, days only, spring quarter

5.916 Engineering Analysis Utilizing Data Processing

Engineering and quantitative management problems utilizing medium to large data processing systems; application areas include simulation and file management; the principles of modern operating systems are discussed in detail. *Prep. 5.913 or equiv.*

Offered yearly, fall quarter

5.930 Basic Computer Systems Technology

Introduction to computer systems and assembly language programming. Topics include: machine language, assemblers, and compilers. Input/output device control. List processing, searching, and sorting; file systems and storage management. Students are required to prepare and test several programs. The emphasis is on basic concepts necessary to understand and evaluate technological development. *Prep. 5.913.*

Offered yearly, fall and winter quarters

5.931 Computer Systems

Introduction to hardware and software packages, on-line real-time comput-

systems, and time-sharing and resource allocation. Telecommunications. Graphics terminals and data collection devices are also discussed. The course seeks to develop the student's understanding of computer technology so that he can successfully employ it in new and creative ways. *Prep. 5.930.*

Offered yearly, winter and spring quarters

.932 Advanced Computer Systems

Topics in the forefront of the computer software field. Discussion of the design choices in Advanced Computer Systems raises the major design and operating issues concerning digital computers. *Prep. 5.931.* Not offered 1974-75

.940 Basic Information System Technology

Introduction to the concepts which support the field of information systems. Introduction to hardware and software systems and structuring problems in computer terms. Both lectures and cases are used to illustrate basic issues which include hardware components and their relative speeds, methods for balancing systems components, models of machines and concepts underlying application programs, translators, utilities, and operation systems. Data structures and data management are treated from the viewpoint of optimizing systems design for large scale data bases. *Prep. Bachelor of Science degree in Engineering or Science and 5.913.*

Offered yearly, fall and winter

.941 Management Information Systems

The development of a framework which emphasizes support to management decision making. Theoretical and pragmatic considerations are used as a base from which a final framework is developed. This framework is applied to the design, installation, and evaluation of traditional management information systems (formerly 5.818). *Prep. Bachelor of Science degree for Engineering or Science.*

Offered yearly, all quarters

.942 Advanced Management Information Systems

Designed to provide greater depth and some practical exposure to the issues and concepts raised in Management Information Systems. Topics will include design models for modular systems with emphasis on on-line, real-time systems and project planning and control. *Prep. 5.940, 5.941.*

Offered yearly, spring quarters

.943 Management Decision Systems

Seminar course exploring the design issues involved in building management decision systems. Includes methods of making explicit the manager's decision processes, as well as the design process for building effective man/machine systems. *Prep. 5.940, 5.941.*

Not offered in 1974-75

.950 Engineering Statistics I

Brief though rigorous introduction to probability as foundation for statistics; discrete and continuous distributions such as the binomial, Poisson, hypergeometric and normal; mean and variance; operations research; sampling distributions. *Prep. Bachelor of Science degree in Engineering or Science.*

Offered yearly, all quarters

.951 Engineering Statistics II

An introduction to the techniques of statistical inference, treatment of statistical data, inferences concerning means, variances and proportions, regression

analysis, correlation and other statistical concepts. *Prep. 5.950, Engineering Statistics I or 10.8G1, Probability or equivalent.* Offered yearly, all quarters

5.952 Design of Experiments I

An introduction to experimental design and analysis; modeling for fixed, random and mixed factor designs such as: single factor, randomized block Latin square and factorial experiments, analysis of variance and covariance, orthogonal contrasts. *Prep. 5.951, Engineering Statistics II or 10.9H1, Mathematical Statistics or equivalent.* Offered yearly, fall quarter

5.953 Statistical Decision Theory

Use of Bayesian statistical inference to arrive at decisions when stochastic variables are interacting; relationship to game theory; decision making over time in a sequence; important expected values and distributions; relationship of Bayesian decision theory to classical statistical inference. *Prep. 5.951, Engineering Statistics I or 10.8G1, Probability or equivalent.* Offered yearly, fall quarter

5.954 Advanced Quality Control

Economics of quality, specification of quality, organization for quality, statistical methods of quality control; quality policies and objectives; personnel methods for quality; design of testing and inspection procedures; budgeting quality programs; sampling by variables, sampling for life testing, continuous sampling. *Prep. 5.951, Engineering Statistics II or equivalent.* Offered yearly, winter quarter

5.955 Reliability and Maintainability Applications

An introduction to reliability and maintainability engineering technology applied to system and circuit design; the "bath-tub" curve; stress de-rating of components; failure rate and repair rate prediction techniques and assessment of early failure, useful life, and wearout characteristics. *Prep. 5.951, Engineering Statistics II or equivalent.* Offered yearly, fall quarter

5.956 Mathematical Theory of Reliability

Probability mathematical techniques utilized in systems reliability analysis; prediction; allocation and demonstration testing; reliability probability function; active and standby redundancy with or without repair, spares planning, availability. *Prep. 5.955, Reliability and Maintainability Applications.* Offered yearly, winter quarter

5.957 Designing for Reliability

Oriented to the design of electronic systems; development of complex system reliability mathematical models; Markovian chain stochastic processes, matrix algebra applied to redundancy problems; flow-diagram techniques using Laplacian transforms, and queuing theory for repairable systems; system effectiveness methods particularly those developed by Hunter and Barlow. *Prep. 5.955, Reliability and Maintainability Applications.* Offered yearly, spring quarter

5.958 Design of Experiments II

Further design considerations in experimental design and analysis such as nesting, split-plot, factorial confounding, fractional factorial, response surface. Computer applications to design analysis. *Prep. 5.952, Design of Experiments I or equivalent.* Offered yearly, spring quarter

5.991 Thesis (Master's Degree) (6 q.h. credits)

Analytical and/or experimental work conducted under the auspices of the department. *Prep. Consent of adviser.* Offered yearly, all quarters

5.992 Seminar in Industrial Engineering

Discussion and presentations of thesis related topics by students, presentations and discussions by faculty and eminent people in the field on timely industrial engineering topics. Field trips and visitations included where appropriate.

Offered yearly, days only, fall quarter

5.993 Special Problems in Industrial Engineering

Individual work under faculty supervision. *Prep. Consent of adviser.*

Offered yearly, all quarters

mathematics and physics

For mathematics and physics courses consult the bulletin of the Graduate School of Arts and Sciences.



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UNDERGRADUATE COLLEGES

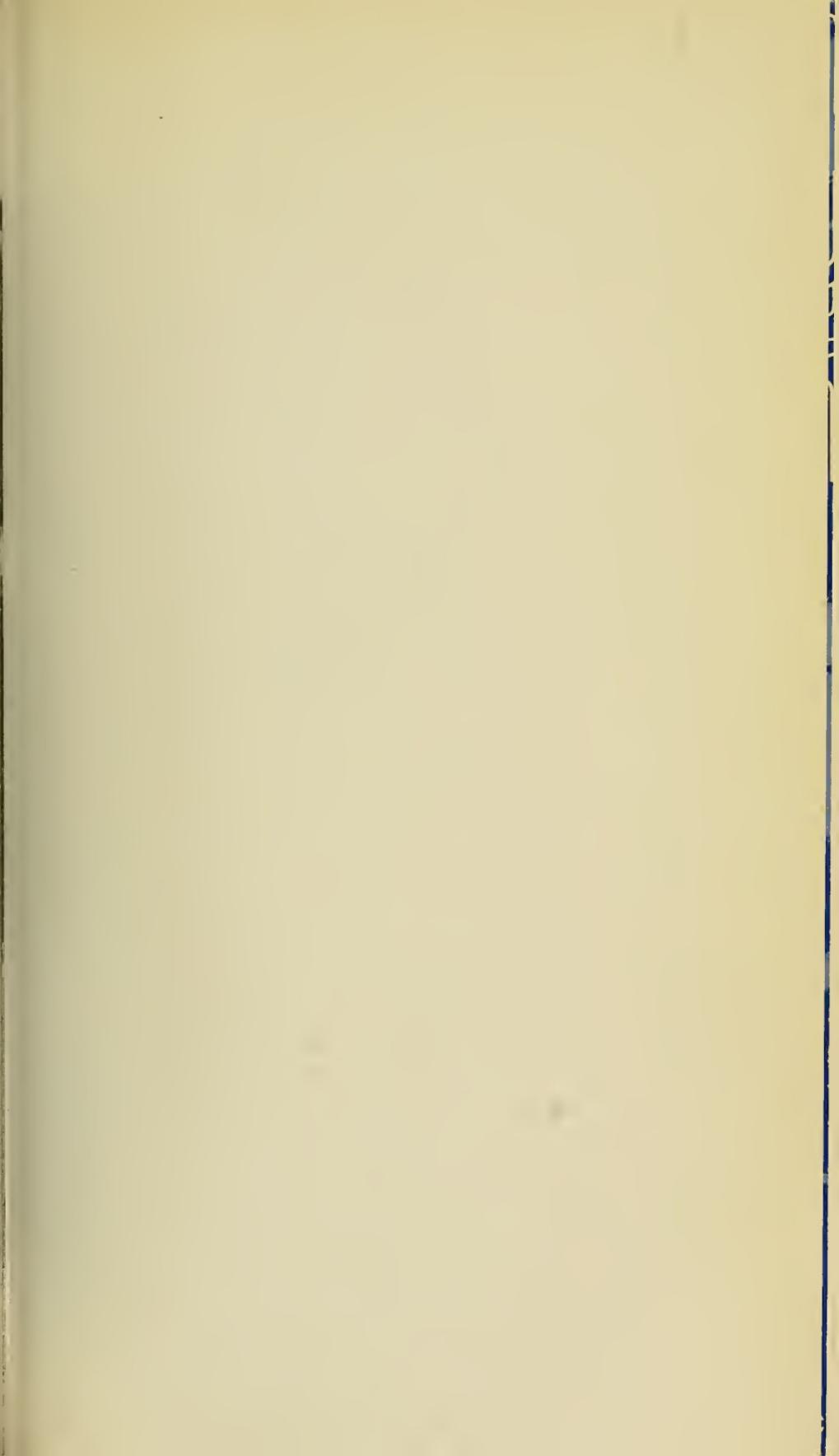
Full-time day curricula on the Cooperative Plan leading to baccalaureate degrees are offered by:

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- College of Criminal Justice
- College of Education
- College of Engineering
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- Lincoln College

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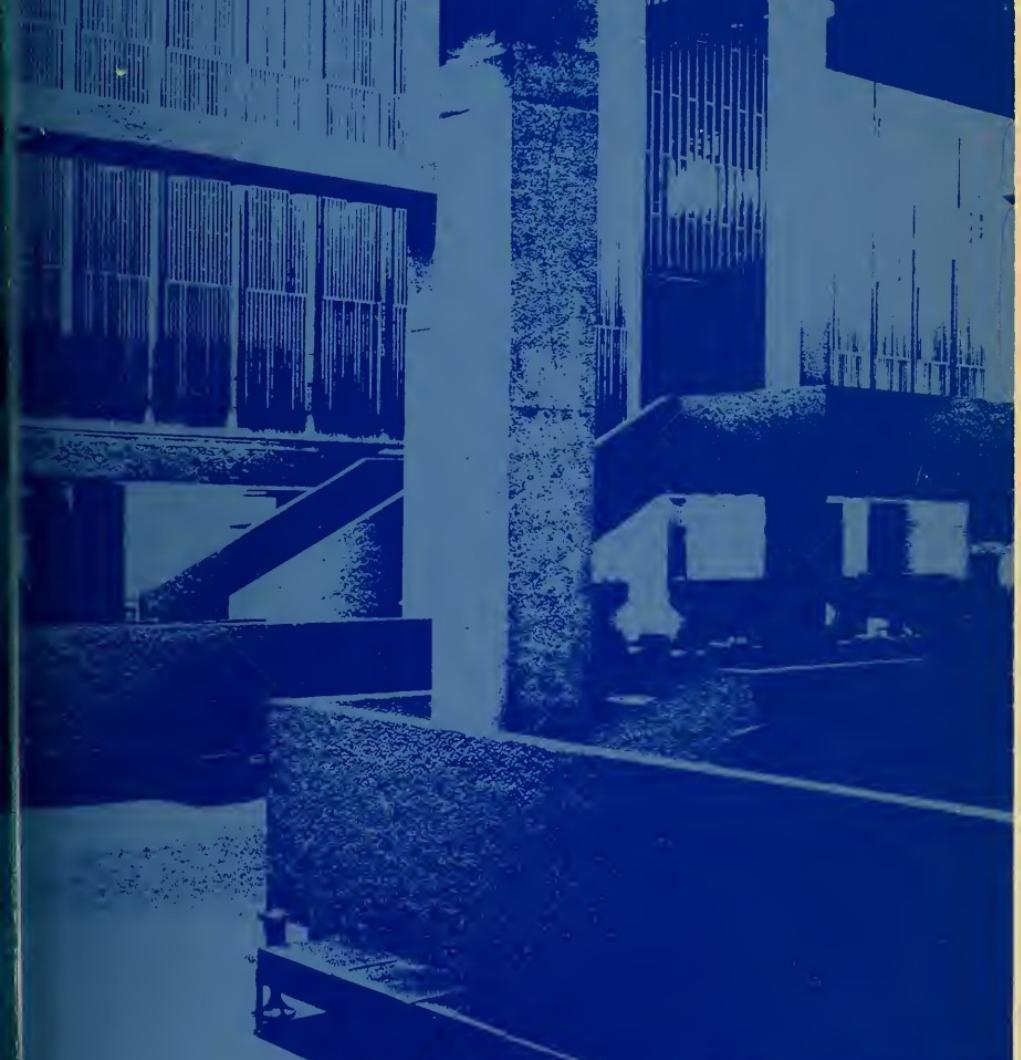






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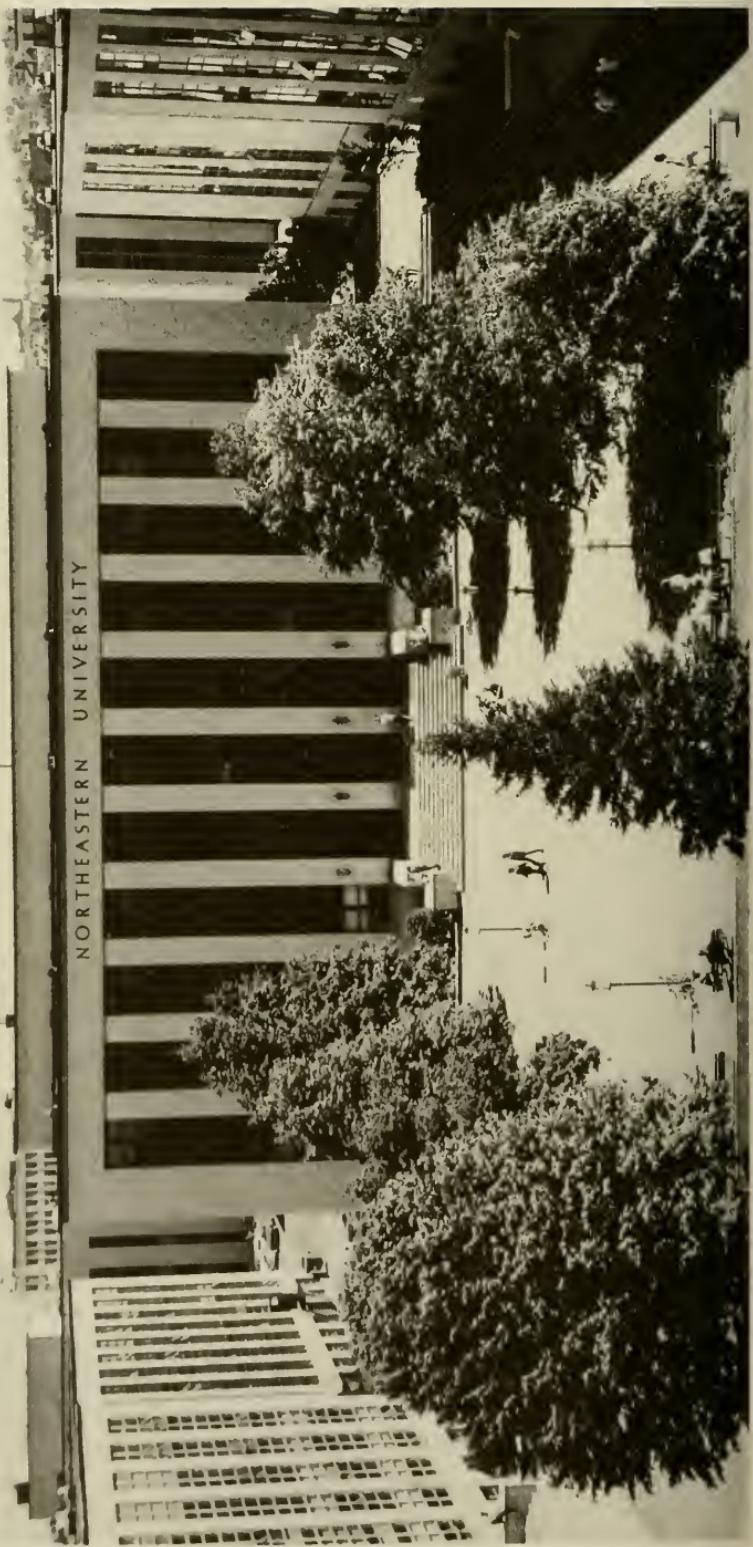


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**Graduate School of Pharmacy
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NORTHEASTERN UNIVERSITY



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<u>MAP REFERENCE</u>	<u>Building Designation</u>	<u>Building</u>
F6	Balletta Natatorium	BN
F10	Botolph Building	BT
FE6	Physical Education Ctr.	CB
G7	Churchill Hall	CH
A6	Cushing Hall	CU
H6	Dana Research Center	DA
F5	Dockser Hall	DK
E9	Dodge Library	DG
G8	Elli Student Center and	EC
F8	Alumni Auditorium	EL
G6	Forsyth Building	FR
G5	Forsyth Building, Annex	FA
F4	Greenleaf Building	GR
F7	Hayden Hall	HA
G10	Hurtig Hall	HT
B6	Kennedy Building	KB
E4	Knowles Center (Volpe)	KV
E4	Knowles Center (Gryzmish)	KG
J3	11 Leon Street	UO
H3	Afro-American Institute	AF
F9	Mugar Life Sciences Building	MU
F3	Parker Building	PA
E7	Richards Hall	RI
H7	Robinson Hall	RB
G5	United Realty Building	UR



ACADEMIC CALENDAR 1974-1975

Fall Quarter 1974

Registration period		
Burlington	Tuesday-Wednesday	Sept. 17-18
Boston	Monday-Thursday	Sept. 23-26
Classes begin	Monday	Sept. 30
Examination period	Monday-Saturday	Dec. 16-21

Winter Quarter 1974-1975

Registration period		
Burlington	Tuesday	Dec. 3
Boston	Monday-Thursday	Dec. 9-12
Classes begin	Monday	Jan. 6
Examination period	Monday-Saturday	Mar. 24-29

Spring Quarter 1975

Registration period		
Burlington	Tuesday	March 11
Boston	Monday-Thursday	Mar. 17-20
Classes begin	Monday	April 7
Last day to file commencement card for Spring Commencement	Tuesday	April 1
Last day to pay fee for Spring Commencement	Wednesday	April 30
Final grades due in Registrar's Office for June graduates taking third quarter course	Friday	June 6
Examination period	Monday-Saturday	June 16-21
Spring Commencement	Sunday	June 22

Summer Quarter 1975

Registration period		
Burlington	Monday-Tuesday	June 16-17
Boston	Wednesday-Thursday	June 18-19
Classes begin	Monday	June 30
Last day to file commencement card for Fall Commencement	Tuesday	July 1
Last day to pay fee for Fall Commencement	Friday	August 1
Examination period	Wednesday-Saturday	Aug. 6-9

UNIVERSITY HOLIDAYS 1974-75

Columbus Day	Monday	October 14
Veterans' Day	Monday	October 28
Thanksgiving Recess	Thursday-Saturday	Nov. 28-30
Christmas Vacation	Monday-Tuesday	Dec. 23-Jan. 4
Washington's Birthday	Monday	February 17
Patriots' Day	Monday	April 21
Memorial Day	Monday	May 26
Independence Day	Friday	July 4
Labor Day	Monday	September 1

Equal Opportunity Policy

Northeastern University is committed to a policy of providing equal opportunity for all. In all matters involving admission, registration, and all official relationships with students, including evaluation of academic performance, the University insists on a policy of nondiscrimination. Northeastern University is also an equal opportunity employer; it is institutional policy that there shall not be any discrimination against any employee or applicant for employment because of race, color, religion, sex, age or national origin. In addition, Northeastern takes affirmative action in the recruitment of students and employees.

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1974-1975

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Dharmendra Verma, *Associate Professor of Marketing*
Elizabeth Van Slyck, *Professor of Physical Therapy*
Arthur Weitzman, *Professor of English*
Robert N. Wiener, *Associate Professor of Chemistry*
Richard Zobel, *Professor of Physical Education*

Administrative Committee of the Graduate Schools

Sidney Herman, *Chairman, Associate Dean of Faculty*
Francis W. Casey, *Secretary, Registrar of the Graduate Schools*
Catherine L. Allen, *Director of Boston-Bouvé College Graduate School*
Alvah K. Borman, *Dean of Graduate Placement Services*
Barbara Burke, *Executive Assistant to the Dean of the School of Law and Director of Placement for the School of Law*
Geoffrey Crofts, *Director of the Graduate School of Actuarial Science*
Philip T. Crotty, Jr., *Associate Dean of Business Administration*
Joseph M. Golemme, *Director of the Graduate School of Professional Accounting*
George W. Hankinson, *Director of the Graduate School of Engineering*
James S. Hekimian, *Dean of Business Administration*
John W. Jordan, *Assistant Dean of Business Administration and Director of the Graduate School of Business Administration*
Robert H. Ketchum, *Assistant Dean of Liberal Arts and Director of the Graduate School of Arts and Sciences*
Alan A. Mackey, *Associate Dean of University Administration and University Registrar*
Melvin Mark, *Dean of Engineering*
Frank E. Marsh, Jr., *Dean of Education*
Edmund J. Mullen, *Assistant Dean of University Administration and Associate University Registrar*
John C. O'Byrne, *Dean of the School of Law*

*Barbara Philbrick, Associate Professor of Physical Education and
Coordinator of Programs for Boston-Bouvé College
Graduate School*

Marianne Radziewicz, Registrar of the School of Law

*Norman Rosenblatt, Dean of Criminal Justice and Director
of the Graduate Program in Criminal Justice*

Philip J. Rusche, Director of the Graduate School of Education

Albert A. Shepard, Dean of Liberal Arts

*Robert Soloway, Director of the Graduate School of Pharmacy and
Allied Health Professions*

Ex Officio

Arthur E. Fitzgerald, Dean of Faculty

Ring M. Thompson, Dean of Planning

the university

Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under General Laws of Massachusetts. The State Legislature by special enactment has given the University general degree-granting powers. The University is governed by a Board of Trustees elected by and from Northeastern University Corporation, which is composed of nearly 100 distinguished business and professional men and women.

From its beginning, Northeastern University has had as its dominant purpose the discovery of community educational needs and the meeting of these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Cooperative Plan initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922), Liberal Arts (1931), Education (1953), Pharmacy (1962), Nursing (1964); Boston-Bouvé College (1964); the College of Criminal Justice (1967); and by Lincoln College's daytime Bachelor of Engineering Technology program (1968). This educational method enables students to gain valuable practical experience as an integral part of their college program and also provides the means by which they may contribute substantially to the financing of their education. The Plan has been extended to the graduate level in engineering, actuarial science, rehabilitation administration, professional accounting, business administration, and law.

In the field of adult education, programs of study have been developed to meet a variety of needs. University College offers evening courses — offered by the University since 1906 — and adult courses leading to the bachelor's degree. In addition to offering undergraduate programs in Electrical Engineering Technology and Mechanical Engineering Technology, Lincoln College offers evening part-time certificate, associate, and bachelor degree programs in technological areas. All formal courses of study leading to degrees through part-time programs are approved by the Basic College faculties concerned.

GRADUATE AND PROFESSIONAL SCHOOLS

The 10 graduate and professional schools of the University offer day and evening programs leading to the degrees listed.

The Graduate School of Actuarial Science offers the degree of Master of Science in Actuarial Science.

The Graduate School of Arts and Sciences offers the degrees of Master of Arts, Master of Science, Master of Science in Health Science, Master of Public Administration, and Doctor of Philosophy.

The Graduate School of Boston-Bouvé College offers the degree of Master of Science, with specialization in Physical Education and Recreation Education.

The Graduate School of Business Administration offers the degree of Master of Business Administration.

The Graduate Program in Criminal Justice offers the degree of Master of Science.

The Graduate School of Education offers the degree of Master of Education and the Certificate of Advanced Graduate Study.

The Graduate School of Engineering offers the degrees of Master of Science, Engineer degree, Doctor of Engineering, and Doctor of Philosophy.

The School of Law offers the degree of Juris Doctor.

The Graduate School of Pharmacy and Allied Health Professions offers the degrees of Master of Science and Doctor of Philosophy.

The Graduate School of Professional Accounting offers the degree of Master of Science in Accounting.

CENTER FOR CONTINUING EDUCATION

The Center for Continuing Education was established in 1960 to relate University to the needs of its community in a period of accelerated change. Adult education programs offered by the Center and University College have since been consolidated. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. The Division of Special Programs, working cooperatively with trade associations and professional societies, offers a wide variety of programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

RESEARCH ACTIVITIES

The facilities of the University are engaged in a wide variety of basic research projects in business, science, social science, pharmacy, and engineering. These are coordinated by the Dean of Research, whose services are University-wide and available to the faculties of all the Colleges.

Although Northeastern is primarily concerned with undergraduate and graduate instruction, the University believes that the most effective teaching and learning take place in an environment characterized by research activities directed toward extending the frontiers of knowledge.

buildings and facilities

MAIN CAMPUS

The main campus of Northeastern University is located at 360 Huntington Avenue in the Back Bay section of Boston. Many of the city's famous cultural, educational, and philanthropic institutions are situated in the Back Bay, including the Museum of Fine Arts, Symphony Hall, Horticultural Hall, the Isabella Stewart Gardner Museum, the Harvard teaching hospitals, the Boston Public Library, and many schools and colleges. Most are within walking distance of Northeastern University.

Major transportation facilities serving the Boston area are Logan International Airport, two rail terminals, bus terminals serving interstate and intrastate lines, and MBTA subway-bus service within the metropolitan suburban area. There is a subway stop in front of the campus. For motorists, the best routes to the campus are the Massachusetts Turnpike (Exit 22) and Route 9, of which Huntington Avenue is the intown section.

The campus of 48 acres is divided by Huntington Avenue, with the main educational buildings on one side and dormitories on the other. The principal buildings, all of which have been constructed since 1950, are of glazed brick in contemporary classic style. Most are interconnected by underground passageways.

EII Student Center

The Carl S. EII Student Center provides facilities for student recreation and for extracurricular activities. The Alumni Auditorium, with seating capacity of 1,300, is part of the Center. Also included are speech drama facilities, a ballroom, main lounge, fine arts exhibition area, student offices, conference rooms, and a dining area seating more than 1,000.

Libraries

The University library system consists of the Dodge Library, which is the main library; the Suburban Campus Library at Burlington; the School of Law Library; and divisional libraries for Physics and Electrical Engineering, Chemistry and Biology, Mathematics and Psychology, Health, Physical and Recreation Education, and Physical Therapy. There are additional subject collections for the Center for Management Development at Andover, Massachusetts, and the Marine Science Institute in Nahant.

The library collections number 360,000 volumes supplemented by me 267,000 titles in microprint, microfilm, and microfiche forms. The llection includes, in addition, some 3,500 periodical titles, 90,000 cuments, and 4,600 sound recordings.

Cabot Physical Education Center

The Godfrey Lowell Cabot Physical Education Center is one of the st equipped in New England. The large gymnasium contains four sketball courts. In addition, the Center consists of an athletic cage, small gymnasium, and a rifle range, as well as administrative offices the Department of Athletics and for the Physical Education Depart- nt of Boston-Bouvé College.

A recent addition to the center, the Barletta Natatorium, houses a 5-foot swimming pool, a practice tank for the crew, handball courts, shower and dressing facilities.

Dockser Hall

Charles and Estelle Dockser Hall, completed in 1968, houses a large nnasium, dance studio, motor performance laboratory, college li- ry, community recreation laboratory, folk arts center, dark and music ms, recreation resources area, locker rooms, offices, classrooms, ference room and lounge, storage facilities, and a research oratory.

Apartments for Graduate Students

The University maintains a 100-apartment housing unit which accommodates 279 people. Two-, three-, and four-party apartments are available which vary in size from two to four rooms plus bath. Apartments are finished with beds, chairs, desks, stove, refrigerator, and kitchen table. The cost includes all utilities.

\$50 deposit is required when making application for the apartments. Applications are available in the Office of University Housing. Students are expected to make such arrangements on a term-to-term basis but may live in the apartments both while on cooperative work assignments in school if they wish. All reservations are made on a first come, first served basis.

SUBURBAN FACILITIES

Suburban Campus

The Suburban Campus, located near the junction of Routes 128 and 3 in Burlington, Massachusetts, was established to meet the needs of individuals and of industry in the area.

In addition to graduate courses in engineering, business administration, science, education, and the arts, portions of undergraduate programs leading to the associate and bachelor degrees, special programs for adults, and noncredit state-of-the-art programs are offered.

Warren Center

The Warren Center is a practical laboratory for Boston-Bouvé College in outdoor education and conservation, in group practicum, and camping administration, programming, and counseling. At this Center Ashland, completed in 1967, there are tennis courts, field hockey and lacrosse fields, waterfront for swimming and boating, overnight campsites, fields and forests, heated cottages, the Hayden Lodge with recreation hall, library, crafts shop, dining facilities, and conference accommodations.

Henderson House

The University's conference center, Henderson House, is located in Weston, Massachusetts. The Center for Continuing Education conducts short-term courses, seminars, and special institutes for business, professional, and research groups. Henderson House is 12 miles from the main campus.

Marine Science Institute

The Marine Science Institute at Nahant, Massachusetts, is a research and instructional facility primarily engaged in studies of marine biology and oceanography. The Institute is operated all year, and is about 15 miles northeast of Boston. Many of the courses at this institute are applicable toward an advanced degree in biology or health science.

Government Center Campus

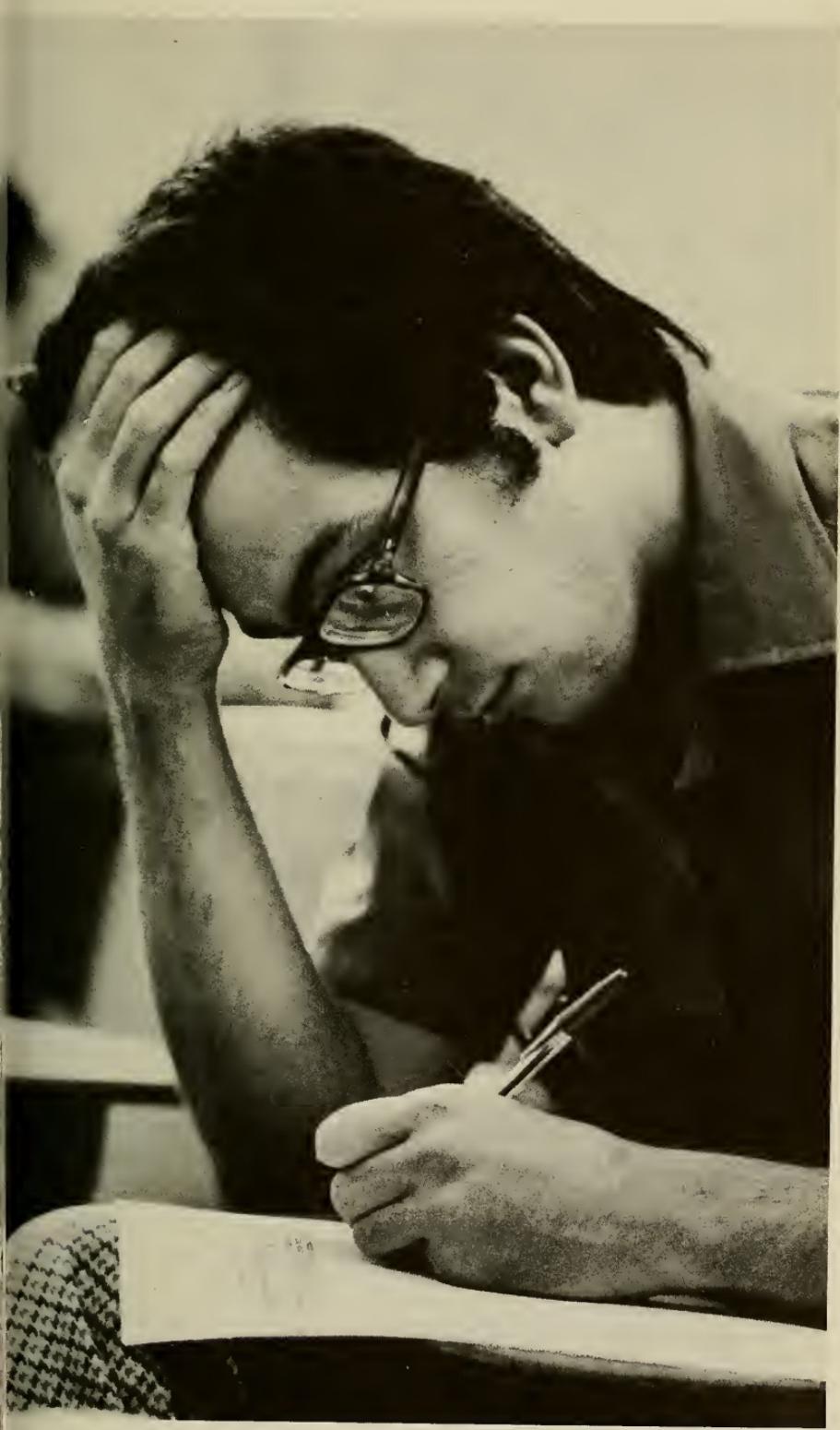
With the cooperation of the Federal Executive Board, the Graduate School of Liberal Arts' Department of Political Science offers an enter Master of Public Administration program at the John F. Kennedy Building in downtown Boston. This program is primarily for individuals employed in Federal, state, or local civil services.

Brockton, Nashua, and Framingham Campuses

For students residing in southeastern Massachusetts and northeastern Rhode Island, the Graduate School of Business Administration offers a significant portion of its M.B.A. Program at facilities in Brockton, Massachusetts. These facilities, made available by the Knapp Corporation, are located on West Chestnut Street in Brockton.

Students residing in the southern New Hampshire area may take a significant portion of the M.B.A. Program at facilities in Nashua, New Hampshire. These facilities are furnished by Sanders Associates, Inc., and are located in their headquarters on Route 3, just over the Massachusetts line.

For students in the Framingham-Worcester area, a significant portion of the M.B.A. Program may be taken at classroom facilities located in Framingham, Massachusetts.



the graduate school of pharmacy and allied health professions

The New England College of Pharmacy merged with Northeastern University in 1962 to become the College of Pharmacy of Northeastern University. The Graduate School of Pharmaceutical Sciences was established in 1964 and offered on a full-time basis Master of Science degree programs in Hospital Pharmacy, Industrial Pharmacy, Medicinal Chemistry, and Pharmacology. All of these programs involved one year of planned cooperative work experience. In 1970 a doctoral program leading to the Ph.D. in Medicinal Chemistry was instituted.

The necessity for making these Master of Science degree programs more relevant to the greater Boston community led to the establishment of part-time evening programs. In 1971 the Division of Allied Health Sciences joined with the College of Pharmacy to establish the new College of Pharmacy and Allied Health Professions. In 1972 two new part-time Master of Science degree programs were inaugurated, one in Medical Laboratory Science and the second in Clinical Chemistry, the latter being cosponsored by the Chemistry Department in the Graduate School of Arts and Sciences. In 1974 a Master of Science degree program in Radiopharmaceutical Science was established.

Currently the College offers the following graduate programs:

Master of Science

- Clinical Chemistry
- Hospital Pharmacy
- Medical Laboratory Science
- Medicinal Chemistry
- Pharmacology
- Radiopharmaceutical Science

Doctor of Philosophy

- Medicinal Chemistry

GENERAL REGULATIONS

The general regulations that follow are minimal requirements shared by the several degree programs. The student is advised to consult the appropriate program for a statement of specific requirements.

Application

Applicants should address their inquiries to the Director of the Graduate School of Pharmacy and Allied Health Professions. Application forms and other pertinent information will then be mailed to them. Submission of the completed forms, together with all official transcripts and two letters of recommendation, is essential before potential students can be considered for admission to a specific degree program. Applicants whose native language is not English must take the Test of English as a Foreign Language and submit the results to the Director of the Graduate School of Pharmacy and Allied Health Professions. All necessary supporting documents must be on file at least four weeks before the date of registration for the quarter in which the student expects to begin his scholastic program. Applications received after this date may result in the student's being considered for the following quarter.

Applicants to the doctoral program who desire assistantships should apply no later than March 15. It may not be possible to give equal consideration to applications received after this date. Candidates for financial awards should so indicate in their letter of application. These awards are restricted to full-time doctoral students. Such applicants are strongly urged to take both the aptitude and advanced portions of the Graduate Record Examination.

Admission

To be enrolled for graduate work, an applicant must submit a complete official transcript indicating the award of a baccalaureate degree from a recognized institution. He must also provide evidence of ability to pursue creditably a program of graduate study in his chosen field. His scholastic record must therefore show academic distinction, and his undergraduate program must show breadth as well as adequate preparation in his field of anticipated specialization. Acceptance to the school is granted upon recommendation of the Graduate Committee of Pharmacy and Allied Health Professions after a review of the completed application.

Foreign students who do not receive a graduate award or whose award is insufficient to cover all educational and living expenses must certify that they are able to meet all such expenses while at the University. A visa may not be granted without such certification. Foreign students should note that all master's degree programs are part-time and, therefore, they are not eligible for I-20 visas.

Student Classifications

Regular Students—Those students accepted to a specific degree program.

Special Students—Students who have been accepted in the Graduate School, but who are not formally matriculated in a degree program. Students in this category who wish to be admitted to a degree program must petition the Graduate Committee requesting a change in status. Generally, this request is made after the completion of 12 quarter hours or one academic year, whichever is sooner. No more than 16 quarter hours may be transferred from the Special Student category to a degree program. In those instances where additional courses have been taken, only the first 16 quarter hours of credit will be accepted. All courses within this quarter-hour limitation will be transferred if the student is admitted to a degree program; included will be C, F, and I grades. It is the student's responsibility to request a change of status in writing.

Doctoral Students—Students admitted to a doctoral program.

Doctoral Degree Candidates—Doctoral students who have completed 40 quarter hours of acceptable graduate work and have passed the qualifying examination.

Registration

Students must register within the dates and times listed on the school calendar. The place of registration is announced prior to each period.

Residence

All course work for advanced degrees must be registered for and completed at Northeastern University unless the Graduate Committee has granted approval of work taken elsewhere.

Programs of Study

The study load for full-time students is usually three to four courses per quarter. Part-time students decide upon their course load after consulting with the director of their specific program. Courses in most fields are generally offered in the late afternoon and evening. Exceptions to this are posted with the quarterly list of course offerings.

Grading System

Performance of students in graduate courses is graded as follows:

A Excellent

This grade is given to those students whose performance in the course has been of very high graduate caliber.

B Satisfactory

This grade is given to those students whose performance in the course has been at a satisfactory level.

C Fair

This grade is given to those students whose performance in the course is not at the level expected in graduate work.

F Failure

This grade is given to those students whose performance in the course is unsatisfactory.

In addition, the following letter designations are used:

I Incomplete without quality designation.

This grade may be given to those students who fail to complete the work of the course.

L Audit without credit.**S Satisfactory without quality designation.****U Unsatisfactory without quality designation.**

An S or U grade is used for the first quarter of a two-quarter sequence in which the grade for the second quarter applies to both the first- and second-quarter sequence.

The I grade will be changed to a letter grade when the deficiency which led to it is made up to the satisfaction of, and in the manner prescribed by, the course instructor, or, in his absence, by the chairman of the department issuing the grade. The period for clearing such a grade is restricted to one calendar year from the date of its first recording on the student's permanent record.

Students must indicate their preference for auditing a course at registration. No credit is given for the course; however, it will appear on the student's transcript. Registration changes from an audit to a graded status, or vice versa, must be made prior to the second week of classes. The tuition fee for an audit course is the same as that for a graded course.

Class Hours and Credits

All courses are entered as quarter-hour credits. A quarter hour of credit is equivalent to three fourths of a semester-hour credit.

Continuity of Program

Students are expected to maintain continuous progress toward a degree. Any student who does not attend Northeastern for a period of one year must apply for readmission.

Withdrawals

In order to withdraw from a course, a student must complete an official withdrawal form obtained at the Registrar's Office or at the suburban Campus Office. Withdrawals may be made prior to the completion of 75 percent of the course or upon the receipt of a mid-term examination, whichever is later. Students are withdrawn on the date at which the official form is filed with the Registrar. Ceasing to

attend class or notifying the instructor does not constitute official withdrawal.

Changes in Requirements

The continuing development of the Graduate School forces frequent revision of curricula. In every new bulletin some improvements are indicated. When no hardship is imposed on the student because of changes, and when the facilities of the school permit, the students are expected to meet the requirements of the current bulletin. Any deviation from this must be requested by petition to the Graduate Committee.

Application for the Diploma

A commencement card must be filed with the Registrar's Office one month before the applicable date listed in the calendar. For students failing to file, there is no assurance that the degree will be granted in that particular year, even though all other requirements have been fulfilled.

THE MASTER OF SCIENCE DEGREE

Admission

Specific requirements for each degree program are found in the appropriate paragraphs for each program, beginning on page 40.

Academic Requirements

A candidate for the Master of Science degree must complete a minimum of 40-43 quarter hours of correlated work of graduate caliber and such other study as may be required by the specific program.

During the first half of the total course work hours required for the degree, the candidate is expected to maintain a minimum quality-point average of 2.5. At completion of three fourths of the total course work hours required for the degree, the candidate is expected to have a quality-point average of 2.8. To qualify for the degree, he must obtain a final average of 3.0, equivalent to a grade of B. This average is calculated quarterly by the Graduate School on the basis of A = 4, B = 3, C = 2, and F = 0, and excludes any transfer credits from outside the University.

Not more than four quarter hours (generally two courses) of repeated courses, additional courses, or permanent Is may be allowed in order to satisfy the degree requirements.

Within the above limitations, a required course for which a grade of F is received must be repeated with a grade of C or better, and maybe repeated only once. If a grade of F is received in an elective course, that course may be repeated only once to obtain a grade of C or better; another elective course may be substituted for it. If a grade of G is received in a required course, that course may be repeated once to obtain a grade of B or better.

Transfer Credit

A maximum of 12 quarter hours of credit obtained at another institution may be accepted toward the master's degree, provided that the credits transferred consist of A or B grades in graduate-level courses, are in the candidate's field, have been earned at a recognized institution, and have not been applied toward any other degree. Students should petition the Graduate Committee in writing for all transfer credit. Transfer credit grades may not be used in order to obtain the academic average necessary for completion of degree requirements.

Time Limitation

Course credits earned in the program of graduate study, or accepted by transfer, are valid for a maximum of seven years unless an extension granted by the Committee of the Graduate School of Pharmacy and Allied Health Professions.

THE DOCTOR OF PHILOSOPHY DEGREE

The Doctor of Philosophy degree is awarded to candidates who give evidence of high attainment and research ability in their major field. The degree requirements are administered by the Graduate Committee of the College of Pharmacy and Allied Health Professions. It is the responsibility of the Director of the Doctoral Program to certify to the Graduate Committee the completion of all requirements for each candidate.

Admission

The degree program in Medicinal Chemistry has an established admission procedure for students starting doctoral work at Northwestern University.

Residence Requirements

Candidates for the Doctor of Philosophy degree must spend the equivalent of at least one academic year in residence at the University full-time graduate students. The Graduate Committee specifies the method of satisfying the residence requirement.

Doctoral Entrance Examination

Upon acceptance into the doctoral program, the student must take an entrance examination. The purpose of this examination is twofold: to test his undergraduate knowledge and skills considered essential to success in the field of specialization, and to aid both the student and a selected faculty adviser in course selection to overcome existing deficiencies in academic background. Within one year of admission to the doctoral program, the student is allowed two opportunities to pass the examination.

At its discretion, the Department of Medicinal Chemistry and Pharmacology may drop a student from the doctoral program if the results of the doctoral entrance examination reveal deficiencies too great to be removed within one year.

Qualifying Examination

A qualifying examination is prepared by members of the Department and given twice each academic year. It is expected that a student will take this examination within two years from the date of the doctoral entrance examination. The purpose of the qualifying examination is to test the student's knowledge and skills in Medicinal Chemistry and especially his knowledge of recent developments in this field.

This examination is composed of two parts:

1. A written examination in areas of Medicinal Chemistry to be determined by the Department.
2. An oral examination, given approximately two weeks after completion of part 1. The oral examination committee consists of the dissertation adviser (selection discussed below), two other members of the Department of Medicinal Chemistry and Pharmacology, and one member of the University from outside the Department selected by the Department Chairman. The student must pass the written portion before taking the oral examination at the scheduled time. Students failing the written part of the qualifying examination are given one opportunity to remove the failure by a make-up examination. Similarly, students have one additional opportunity to pass the oral examination. Students must make up any failure at the first opportunity. Those failing either portion of this examination twice are dropped from the program. A student who passes the qualifying examination and completes 40 quarter hours of graduate work with a 3.0 average is designated a Doctoral Degree Candidate.

Course Requirements

The minimum course requirement of 40 quarter hours of credit constitutes the work normally required for the master's degree. The course requirements beyond this total for the Ph.D. degree will depend upon the needs and interests of the individual.

Transfer Credit

If transfer credit for doctoral work is desired, approval of such credit must be given by the Director of the Ph.D. program. A maximum of 12 quarter hours of graduate credit obtained at a recognized institution are accepted, provided that the credits transferred are in the candidate's field, consist of work taken at a graduate level for graduate credit, all carry grades of A or B. Students should petition the Director of the

Graduate School of Pharmacy and Allied Health Professions in writing for all transfer credit.

Dissertation

Each doctoral student must complete a dissertation which embodies the results of extended research and which makes an original contribution to the field. This work should give evidence of the candidate's ability to conduct independent investigation and to interpret the results of his research in an acceptable manner.

Selection of a thesis adviser must be made within four months of the student's completion of the entrance examinations. An adviser is selected by mutual consent of the student and a member of the faculty in the Department of Medicinal Chemistry and Pharmacology. It is expected that the student will begin his research and demonstrate satisfactory proficiency in the laboratory prior to the qualifying examination.

The thesis adviser serves as Chairman of the Thesis Committee, which consists of not less than three members. Individuals are chosen or expertise in the student's area of research. His research progress is evaluated by this Committee, meeting no less than twice a year. Low productivity or unsatisfactory work provides the basis for warning by his Committee. Two such warnings result in a student's dismissal from the program at any stage.

Foreign Language

A reading knowledge of one foreign language (French, German, or Russian) is required. The Thesis Committee prescribes the manner in which proficiency in the language is determined.

Research Proposal Defense

After completion of the qualifying examination, and prior to the final oral, the student, with the approval of the Thesis Committee, prepares a written proposal in an area distinctly different from his thesis. He then defends it orally before this Committee.

Final Oral Examination

The final oral examination is taken after the completion of all other requirements for the degree. This examination must be held at least three weeks before the commencement at which the degree is to be awarded.

The Thesis Committee conducts the final oral examination. The rector of the Graduate School of Pharmacy and Allied Health Professions, together with the Department Chairman and the thesis adviser, appoint any additional members to this Committee which they consider necessary.

The final oral examination deals with the subject matter of the doctoral dissertation, significant developments in the field of the dissertation, and the student's background knowledge in Medicinal Chemistry.

Time Limitation

After the establishment of degree candidacy, a maximum of five years is allowed for completion of the degree requirements.

Registration

All students must register in the Registrar's Office for course work or dissertation as approved by the faculty adviser. Students must be registered for the dissertation during the quarter in which they take the final oral examination.

Curriculum Design

The Graduate School recognizes the divergent backgrounds and goals for individuals who may be accepted into this program. Accordingly, the program is designed to offer flexibility in course selection so as to maximize its relevance to the student's career objective.

INTERDISCIPLINARY PROGRAMS

Some graduate students may wish to pursue doctoral programs which involve substantial work in two or more departments. To meet this need, an interdisciplinary program may be established which corresponds in scope and depth to doctoral standards, but which does not agree exactly with the individual departmental regulations. For such possibilities, the following option is available.

Admission

Application for admission to interdisciplinary doctoral study consists of the submission of a carefully thought-out, written proposal describing the areas of projected study and research. The proposal may be a part of the initial application for admission to graduate study at Northeastern University, or it may be submitted by a student already enrolled. It may be directed to a doctoral degree-granting department or to the Director of the Graduate School, who will then forward it to the appropriate department. In either case, admission to interdisciplinary doctoral study requires favorable recommendation by the sponsoring doctoral degree-granting department and approval by the Graduate Committee of the Graduate School of Pharmacy and Allied Health Professions.

Formation of Interdisciplinary Committee

A student who has been accepted for interdisciplinary study must obtain the consent of an adviser who will direct his doctoral dissertation. This adviser, who may or may not be a member of the

sponsoring department, serves as Chairman of the Interdisciplinary Committee for this student. A second member is appointed from the sponsoring department by its chairman. These two members obtain one or more additional members or request the Director of the Graduate School of Pharmacy and Allied Health Professions to do so. At least two departments must be represented on the committee, and a majority of the committee members must come from doctoral degree-granting departments. The chairman of the sponsoring department notifies the Director of the Graduate School of the committee membership as soon as possible.

Duties of Interdisciplinary Committee

A member of the Interdisciplinary Committee who is also a member of the sponsoring department serves as the registration officer to approve the student's course registration. A copy of the approved course registration must also be filed with the other committee members and with the Graduate Committee of the College of Pharmacy and Allied Health Professions.

The Interdisciplinary Committee is responsible for the administration of the qualifying examination, language examination, approval of the dissertation, and comprehensive examination. This Committee must also certify to the sponsoring department the completion of the requirements for the doctoral degree.

The Interdisciplinary Committee must be assured that the student's program represents standards comparable to those of the sponsoring department and that the program is not so broad that it has inadequate depth in any area. The Director of the Graduate School may review the program at any time to determine whether its objectives are being met.

financial information

FINANCIAL OBLIGATIONS

Tuition

Tuition rates are subject to revision by the Board of Trustees and may change year by year. The current rate is stated in a covering letter for the specific year and program.

Doctoral candidates actively utilizing the resources of the University in their Ph.D. dissertation are charged an additional \$600 per quarter. Those doctoral candidates registered for dissertation work performed off campus are charged \$200 in addition to tuition charges each quarter, and those doctoral candidates who are no longer actively utilizing University resources are charged a continuation fee of \$50 per quarter.

Tuition statements are mailed to students by the Bursar's Office and are payable by check to Northeastern University.

Fees

All students are charged an application fee of \$15 when they apply for the first time to a graduate school at Northeastern University.

Other fees include a charge of \$10 for late payment of tuition and fee of \$25 for all degree candidates, payable before commencement before the applicable date listed on the academic calendar.

For full-time students there is a charge of \$12.50 per quarter for the services available in the Student Center. For teaching assistants and research fellows, the fee is \$6.25 per quarter. All part-time students on the Huntington Avenue Campus are charged 75 cents per quarter.

All full-time students pay a nonrefundable University Health Service fee of \$90 each year. This fee provides Blue Cross-Blue Shield coverage and entitles the student to the medical care furnished by the University Health Services. Tuition and fees are subject to change without notice.

All financial obligations to the University must be discharged prior to graduation.

Refunds

Tuition refunds are granted only on the basis of the date appearing on the student's official withdrawal form. Nonattendance does not constitute official withdrawal. Questions regarding refunds should be directed to the Bursar's Office.

Refunds are granted in accordance with the following schedule:

Official Withdrawal Filed Within:	Percentage of Tuition:
First week of quarter	100
Second week of quarter	75
Third week of quarter	50
Fourth week of quarter	25

FINANCIAL AID

Northeastern University offers fellowships and assistantships for full-time students who are working toward the doctor's degree. They may establish candidacy for these awards by completing the relevant section of the application for admission. Students already enrolled should consult their departmental adviser. There is no financial aid available for the Master of Science programs or for those students enrolled in the Special Student category. Those individuals auditing any course must remit full tuition.

The University does not award financial assistance in any form to students who are not citizens or permanent residents of the United States.

Tuition Assistantships

The College of Pharmacy and Allied Health Professions provides remission of tuition to full-time students assisting eight hours a week in departmental administrative work.

Teaching Assistantships

Teaching Assistantships allowing remission of tuition and a stipend are available to Ph.D. candidates in Medicinal Chemistry. Those holding such awards devote half time to academic assistance directly related to the teaching function and the balance to course work.

Research Fellowships

Research fellowships, including those supported by the National Institutes of Health, carry a stipend and remission of tuition. Certain of these grants require half-time work on research in the department, with the remaining time devoted to course work. Others provide for full-time work on dissertation research. Availability of such fellowships depends upon the receipt of grants or contracts by departmental faculty members.

Martin Luther King, Jr., Scholarships

Established in 1969 in memory of the late Rev. Martin Luther King, Jr., awards are made as openings occur to qualified minority graduate students who show financial need and are accepted to full-time study in the graduate schools of the University. Stipends cover tuition and all fees.

Appointments

Appointments to fellowships and assistantships are ordinarily announced no later than April 15 for the following academic year or

summer. Appointments are for a maximum of three academic quarters and are not automatically renewed. Students who hold assistantships and research fellowships are expected to devote full time to their studies and the duties of the award. They may not accept outside employment without the consent of their faculty adviser and the Director of the Graduate School.

Dormitory Proctorships

A number of proctorships for men and women in dormitories on or near the Huntington Avenue Campus are available each year. Appointments carry a minimum compensation of room and board. Further information and applications may be obtained from the Office of University Housing.

Guaranteed Insured Loan Program

These loans are available through lending institutions in the applicant's home area. Under this program a student may borrow as much as \$2,500 per academic year to a maximum indebtedness of \$10,000. Repayment of principal and interest need not begin until nine months after the termination of studies.

The student must have submitted, through the College Scholarship Service, a Parents' Confidential Statement or, if he has been declared financially independent by the Financial Aid Office, a Student Confidential Statement. These forms are available in the Financial Aid Office.

Applications for the loan itself are available from local banks or the Education Office of your state government. The Financial Aid Office has additional information and necessary application forms for Massachusetts residents.

National Direct Student Loan Program

This program is available to students who are carrying at least one-half the normal academic load, are accepted as degree candidates, and show evidence of financial need.

The maximum amount which may be borrowed in any academic year is \$2,500, and the total of the loans must not exceed \$10,000.

Repayment and interest on these loans do not begin until nine months after the student ceases to carry at least a half-time academic load at an institution of higher education. The repayment of principal may be extended over a 10-year period with the interest at the rate of three percent per annum. Repayment may be deferred up to a total of three years while a borrower is serving as a Peace Corps or VISTA Volunteer.

Additional information and application forms are available from the Office of Financial Aid. The application deadline is September 1 for full-time students. For other students the deadline is six weeks prior to the start of the quarter for which aid is requested.



faculty

GRADUATE FACULTY

Professors

- Arnold S. Goldstein, B.S. Pharmacy, J.D., *Professor of Pharmacology Administration and Acting Chairman, Department of Pharmacy and Pharmacy Administration.*
- O. James Inashima, Ph.D., *Professor of Pharmacology*
- Barry L. Karger, Ph.D., *Professor of Chemistry and Medicinal Chemistry and Director of the Institute of Chemical Analysis, Applications, and Forensic Science*
- Helene A. Loux, Ph.D., M.T. (ASCP), *Associate Dean and Professor of Health Science*
- John L. Neumeyer, Ph.D., *Professor of Medicinal Chemistry and Acting Chairman, Department of Medicinal Chemistry and Pharmacology*
- Robert F. Raffauf, Ph.D., *Professor of Pharmacognosy and Medicinal Chemistry*
- John F. Reinhard, Ph.D., *Professor of Pharmacology*
- Pierre F. Smith, Ph.D., *Professor of Pharmacy*
- Albert H. Soloway, Ph.D., *Director of the Graduate School of Pharmacy and Allied Health Professions, and Acting Dean, College of Pharmacy and Allied Health Professions*
- Elliot Spector, Ph.D., *Professor of Pharmacology*
- John W. Webb, M.S., *Clinical Professor of Pharmacy*

Associate Professors

- Michael A. Davis, Sc.D., *Associate Clinical Professor in Medicinal Chemistry*
- William A. Gouveia, M.S., *Associate Clinical Professor of Pharmacy*
- Britta L. Karlsson, M.S., M.T. (ASCP), *Associate Professor of Health Science (Medical Laboratory Science)*
- Victor D. Warner, Ph.D., *Associate Professor of Medicinal Chemistry*

Assistant Professors

- Judith Barr, M.Ed., M.T. (ASCP), *Assistant Professor of Health Science (Medical Laboratory Science)*
- Roger W. Giese, Ph.D., *Assistant Professor of Clinical Chemistry*
- James J. Gozzo, Ph.D., *Assistant Professor of Health Science*
- Catherine W. Hallsworth, M.S., M.T. (ASCP), *Assistant Professor of Health Science (Medical Laboratory Science)*

Bynum M. Jackson, Ph.D., M.T. (ASCP), Assistant Professor of Health Science (Medical Laboratory Science)
Donald S. Kosersky, Ph.D., Assistant Professor of Pharmacology
Parshotam Madan, Ph.D., Assistant Professor of Pharmacy
Sri K. Melethil, Ph.D., Assistant Professor of Pharmacy
Kenneth Paiva, Pharm.D., Assistant Professor of Pharmacy
George R. Peterson, Ph.D., Assistant Professor of Pharmacology
Clark F. Springgate, Ph.D., Assistant Professor of Health Science (Medical Laboratory Science)

Adjunct Faculty

David E. Bailey, M.S., Lecturer in the Department of Pharmacy and Pharmacy Administration
Howard Christian, M.D., Special Lecturer in Clinical Laboratory Science
Bradley Copeland, M.D., Adjunct Professor of Health Science
John F. Howes, Ph.D., Lecturer in the Department of Medicinal Chemistry and Pharmacology
David Lalka, Ph.D., Lecturer in the Department of Pharmacy and Pharmacy Administration
Philip LeCompte, M.D., Special Lecturer in Clinical Laboratory Science
Manlio A. LoConte, M.D., Lecturer in the Department of Medicinal Chemistry and Pharmacology
Bertil H. Takman, Ph.D., Adjunct Professor of Medicinal Chemistry
Julius A. Vida, Ph.D., Adjunct Professor of Medicinal Chemistry
André Rosowsky, Ph.D., Lecturer in the Department of Medicinal Chemistry and Pharmacology

ADMINISTRATIVE POSITIONS

Albert H. Soloway, Director of the Graduate School of Pharmacy and Allied Health Professions
Carol M. Konis, Administrative Assistant
Michael A. Davis, Director of the Master of Science Degree Program in Radiopharmaceutical Science
Roger W. Giese, Director of the Master of Science Degree Program in Clinical Chemistry
Donald S. Kosersky, Director of the Master of Science Degree Program in Pharmacology
Helene A. Loux, Director of the Master of Science Degree Program in Medical Laboratory Science
Parshotam Madan, Director of the Master of Science Degree Program in Hospital Pharmacy
John L. Neumeyer, Director of the Doctor of Philosophy Degree Program in Medicinal Chemistry
Robert F. Raffauf, Director of the Master of Science Degree Program in Medicinal Chemistry

fields of study

The sections that follow list degree programs and courses available to a student during the typical period of attendance required to obtain each degree. The place and time for which a specific course is offered may be found in the course announcement made available in May for the summer quarter and in June for the following academic year.

PART-TIME MASTER OF SCIENCE DEGREE PROGRAM IN CLINICAL CHEMISTRY

Objectives

At the present time, there is an acute shortage of trained people in clinical chemistry. This is especially critical in view of the increasing need for individuals with in-depth training in the chemical and biological sciences to direct clinical laboratory personnel.

Northeastern offers a part-time, evening Master of Science degree program in Clinical Chemistry under the joint sponsorship of the Department of Chemistry and the Graduate School of Pharmacy and Allied Health Professions. The program is available to people currently practicing clinical chemistry or those with appropriate backgrounds who wish to train for this field.

The development of this program came about through careful deliberation by members of the Departments of Chemistry, Medicinal Chemistry and Pharmacology, and Medical Laboratory Sciences. Thus, it is a truly interdisciplinary offering, representing a composite of the skills and knowledge of each of these disciplines. It is one of a series of graduate programs designed to meet the frequently expressed needs of clinical pathologists.

Admission and Program Features

The Admissions Committee for this program is composed of three faculty members: two from the Department of Medicinal Chemistry and Pharmacology and a third from Medical Laboratory Sciences. The Committee evaluates the background of the applicants, suggests course sequences, and informs the students of those offerings which will maximize their background in clinical chemistry.

For admission to this part-time M.S. degree program, the applicant must have completed a baccalaureate program in biology, chemistry,

medical technology, or pharmacy. Undergraduate requirements are: a minimum of two quarters of organic chemistry, two quarters of analytical chemistry, each with a laboratory or its equivalent, two quarters of human physiology, and two quarters of physical chemistry. An individual who has deficiencies in any of these areas may take appropriate courses at Northeastern University concurrently with those graduate courses which do not require the deficient prerequisites. The appropriate evening courses offered at University College of Northeastern University are: Analytical Chemistry, 12.521-12.526; Organic Chemistry, 12.531-12.533; Physical Chemistry, 12.541-12.543; and Human Anatomy and Physiology, 18.524-18.526. Equivalent courses are accepted from this University or other accredited universities. Students admitted with deficiencies must remove them during the first 12 quarter hours of graduate work. By the completion of the degree requirements, students must have at least one year of acceptable clinical laboratory experience subsequent to attaining the appropriate baccalaureate degree.

The program is available on a part-time basis, with courses offered primarily during the evening hours. Courses are scheduled in the fall, winter, spring, and summer quarters. It is anticipated that students may complete the degree requirements in a minimum of three years; however, the duration may sometimes be increased or decreased to satisfy the particular needs and requirements of the student. No research report or thesis is required.

Curriculum

<i>Required Courses</i>	<i>Credits</i>
12.821 Analytical Separations	2
12.823 Optical Methods of Analysis	2
72.834 Clinical Chemistry I	2
72.835 Clinical Chemistry II	2
72.837 Seminar and Report in Clinical Chemistry*	2
73.845 Radioisotopes in Biological Systems	2
87.807 Biometrics	2
87.810 Functions of Human Systems	2
90.821 Biochemistry I	2
90.822 Biochemistry II	2
90.823 Biochemistry III	2
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QUARTER HOURS	22

*The first quarter of 72.837 is a required course; however, the course may be repeated twice as an elective.

Elective Core

A minimum of 12 credits must be taken from the following list:

12.822 Electroanalytical Chemistry	2
12.824 Special Topics in Analytical Chemistry I	2

12.825	Special Topics in Analytical Chemistry II	2
12.827	Computers in Chemistry	2
12.828	Chemical Instrumentation	2
72.836	Special Topics in Clinical Chemistry	2
72.837	Seminar and Report in Clinical Chemistry	2
72.861	CNS Depressants	2
72.862	Autonomic Drugs	2
72.863	Anti-infectives	2
72.864	Cancer Therapy and Carcinogenesis	2
72.865	Special Topics in Medicinal Chemistry	2
73.816	Concepts in Toxicology I	2
73.817	Concepts in Toxicology II	2
73.844	Drug Metabolism	1
87.811	Pathophysiology I	2
87.812	Pathophysiology II	2
87.833	Immunobiology	2
87.890	Seminar	1

QUARTER HOURS

34

Elective Courses

Taken with the approval of the Director of the M.S. program in Clinical Chemistry and the course instructor. Selection may be made from the above courses, as well as from the following and other appropriate graduate courses in the Graduate School of Pharmacy and Allied Health Professions or in the rest of the University.

11.871	Radiation Physics	2
11.872	Radiobiology and Health Physics	2
12.807	Applications of Radiochemistry	2
12.841	Inorganic Chemistry I	2
12.842	Inorganic Chemistry II	2
12.846	Coordination Chemistry	2
12.861	Advanced Organic Chemistry I	2
12.862	Advanced Organic Chemistry II	2
12.863	Physical Organic Chemistry	2
12.866	Spectrometric Identification of Compounds	2
12.881	Thermodynamics I	2
12.885	Atomic and Molecular Structure I	2
12.893	Kinetics	2
18.245	Serology-Immunology	3
18.840	Comparative Physiology of Regulatory Mechanisms	2
18.842	Vertebrate Endocrinology	2
18.843	Procedures in Endocrinology	3
18.860	Cell Biophysics and Biochemistry	5
18.909	Animal Virology	4
18.940	Microbial Biochemistry	4

72.837	Seminar and Report in Clinical Chemistry	2
72.840	Nuclear Medicine I	2
72.841	Nuclear Medicine II	2
72.842	Radioisotopic Instrumentation	2
72.843	Radioisotopic Application	2
72.844	Seminar and Research Report in Radiopharmaceutical Science	2
72.866	Phytochemistry	2
73.814	Concepts in Pharmacology I	2
73.815	Concepts in Pharmacology II	2
73.818	Special Topics in Pharmacology	2
87.802	Advanced Medical Laboratory Science— Hematology and Immunohematology	4

A minimum total of 40 quarter hours of graduate credit is necessary
for completion of the M.S. degree in Clinical Chemistry.



SAMPLE PROGRAM

MASTER OF SCIENCE IN CLINICAL CHEMISTRY (Required Courses and Possible Electives)

YEAR 1		YEAR 2		YEAR 3		ELECTIVES	
Fall Quarter	Winter Quarter	Fall Quarter	Winter Quarter	Fall Quarter	Winter Quarter	Fall Quarter	Winter Quarter
87.810 Functions of Human Systems 90.821 Biochemistry I	2 73.844 Drug Metabolism 2 90.822 Biochemistry II	2 12.821 Analytical Separations 2 72.834 Clinical Chemistry	2 12.822 Electroanalytical Chemistry 2 72.835 Clinical Chemistry II	2 72.837 Seminar and Report in Clinical Chemistry 2 87.811 Pathophysiology I 2 Elective	2 12.822 Electroanalytical Chemistry II 2 87.812 Pathophysiology II 2 87.833 Immunobiology 2	2 12.807 Applications of Radiochemistry 2 12.825 Special Topics in Analytical Chemistry II 2 12.846 Coordination Chemistry 2 12.893 Kinetics I 2 72.844 Seminar and Research Report in Radiopharmaceutical Science 2 72.861 CNS Depressants 2 72.864 Cancer Therapy and Carcinogenesis 2 87.812 Pathophysiology II 2 87.833 Immunobiology 2	2 12.807 Applications of Radiochemistry 2 12.825 Special Topics in Analytical Chemistry II 2 12.846 Coordination Chemistry 2 12.893 Kinetics I 2 72.844 Seminar and Research Report in Radiopharmaceutical Science 2 72.861 CNS Depressants 2 72.864 Cancer Therapy and Carcinogenesis 2 87.812 Pathophysiology II 2 87.833 Immunobiology 2
Fall Quarter	Winter Quarter	Fall Quarter	Winter Quarter	Fall Quarter	Winter Quarter	Fall Quarter	Winter Quarter
11.12.821 Radiation Physics 12.824 Special Topics in Analytical Chemistry I	2 11.12.827 Computers in Chemistry 2 87.807 Biometrics	11.12.861 Advanced Organic Chemistry 12.881 Thermodynamics I 12.840 Nuclear Medicine I 72.842 Radioisotopic Instrumentation 72.863 Anti-infectives 72.866 Phytochemistry 73.814 Concepts in Pharmacology I	2 11.12.827 Computers in Chemistry 2 87.807 Biometrics	2 11.12.827 Computers in Chemistry 2 11.12.861 Advanced Organic Chemistry II 2 12.862 Advanced Organic Chemistry II 2 12.885 Atomic and Molecular Structure I 2 72.841 Nuclear Medicine II 2 72.843 Radioisotopic Application 2 72.862 Autonomic Drugs 2 73.815 Concepts in Pharmacology II 2 73.816 Concepts in Toxicology I 37.802 Advanced MLS Hematology and Immunology Seminar	2 11.12.827 Computers in Chemistry 2 11.12.861 Advanced Organic Chemistry II 2 12.862 Advanced Organic Chemistry II 2 12.885 Atomic and Molecular Structure I 2 72.841 Nuclear Medicine II 2 72.843 Radioisotopic Application 2 72.862 Autonomic Drugs 2 73.815 Concepts in Pharmacology II 2 73.816 Concepts in Toxicology I 37.802 Advanced MLS Hematology and Immunology Seminar	2 11.12.827 Computers in Chemistry 2 11.12.861 Advanced Organic Chemistry II 2 12.862 Advanced Organic Chemistry II 2 12.885 Atomic and Molecular Structure I 2 72.841 Nuclear Medicine II 2 72.843 Radioisotopic Application 2 72.862 Autonomic Drugs 2 73.815 Concepts in Pharmacology II 2 73.816 Concepts in Toxicology I 37.802 Advanced MLS Hematology and Immunology Seminar	2 11.12.827 Computers in Chemistry 2 11.12.861 Advanced Organic Chemistry II 2 12.862 Advanced Organic Chemistry II 2 12.885 Atomic and Molecular Structure I 2 72.841 Nuclear Medicine II 2 72.843 Radioisotopic Application 2 72.862 Autonomic Drugs 2 73.815 Concepts in Pharmacology II 2 73.816 Concepts in Toxicology I 37.802 Advanced MLS Hematology and Immunology Seminar
Fall Quarter	Winter Quarter	Fall Quarter	Winter Quarter	Fall Quarter	Winter Quarter	Fall Quarter	Winter Quarter
11.12.821 Radiation Physics 12.824 Special Topics in Analytical Chemistry I	2 11.12.827 Computers in Chemistry 2 87.807 Biometrics	11.12.861 Advanced Organic Chemistry 12.881 Thermodynamics I 12.840 Nuclear Medicine I 72.842 Radioisotopic Instrumentation 72.863 Anti-infectives 72.866 Phytochemistry 73.814 Concepts in Pharmacology I	2 11.12.827 Computers in Chemistry 2 87.807 Biometrics	2 11.12.827 Computers in Chemistry 2 11.12.861 Advanced Organic Chemistry II 2 12.862 Advanced Organic Chemistry II 2 12.885 Atomic and Molecular Structure I 2 72.841 Nuclear Medicine II 2 72.843 Radioisotopic Application 2 72.862 Autonomic Drugs 2 73.815 Concepts in Pharmacology II 2 73.816 Concepts in Toxicology I 37.802 Advanced MLS Hematology and Immunology Seminar	2 11.12.827 Computers in Chemistry 2 11.12.861 Advanced Organic Chemistry II 2 12.862 Advanced Organic Chemistry II 2 12.885 Atomic and Molecular Structure I 2 72.841 Nuclear Medicine II 2 72.843 Radioisotopic Application 2 72.862 Autonomic Drugs 2 73.815 Concepts in Pharmacology II 2 73.816 Concepts in Toxicology I 37.802 Advanced MLS Hematology and Immunology Seminar	2 11.12.827 Computers in Chemistry 2 11.12.861 Advanced Organic Chemistry II 2 12.862 Advanced Organic Chemistry II 2 12.885 Atomic and Molecular Structure I 2 72.841 Nuclear Medicine II 2 72.843 Radioisotopic Application 2 72.862 Autonomic Drugs 2 73.815 Concepts in Pharmacology II 2 73.816 Concepts in Toxicology I 37.802 Advanced MLS Hematology and Immunology Seminar	2 11.12.827 Computers in Chemistry 2 11.12.861 Advanced Organic Chemistry II 2 12.862 Advanced Organic Chemistry II 2 12.885 Atomic and Molecular Structure I 2 72.841 Nuclear Medicine II 2 72.843 Radioisotopic Application 2 72.862 Autonomic Drugs 2 73.815 Concepts in Pharmacology II 2 73.816 Concepts in Toxicology I 37.802 Advanced MLS Hematology and Immunology Seminar

PART-TIME MASTER OF SCIENCE DEGREE PROGRAM IN HOSPITAL PHARMACY

Objectives

Institutional pharmacy will constitute a major form of professional practice within the next decade. The pharmacist practicing in this environment must show proficiency in both the administrative and therapeutic spheres. The administrative need is essential, since the director of a hospital pharmacy must have managerial competence in order to direct personnel, determine budgets, interact with hospital administration and other departments, and establish guidelines and objectives for the pharmacy. It is his responsibility to determine the goals and the means for integrating the pharmacy into a high-quality health delivery system.

Additionally, he must be completely knowledgeable of the most modern therapeutic maneuvers, especially as they relate to the preparation and use of drugs. This is the pharmacist's area of expertise. The physician, nurse, and other medical personnel depend upon the modern pharmacist to counsel them in drug usage and selection, contraindication of drugs with specific disease conditions, and problems encountered with drug interactions. His guidance is essential and can only be based upon a comprehensive knowledge of therapeutics.

The function of this program is to prepare the modern pharmacist for such a career in institutional practice.

Admission and Program Features

The Director of the M.S. program in Hospital Pharmacy serves as Chairman of the Admissions Committee. The function of this Committee is to evaluate the background of the applicants and advise the Graduate Committee of their suitability for admission to the program. Additionally, the Director guides the graduate students in course selection and apprises them of those offerings which maximize their individual educational goals.

Admission as a matriculated graduate student is limited to those who possess a B.S. degree in Pharmacy (or an equivalent degree in Pharmacy) from an accredited college of pharmacy. The candidate must have demonstrated an ability to pursue graduate studies as evidenced by undergraduate transcripts and/or other evidence of scholarship.

The program is available on a part-time basis, with courses offered primarily during the evening hours. Courses are scheduled in the fall, winter, and spring quarters. It is anticipated that students may complete the degree requirements in a minimum of three years; however, the duration may in some cases be increased or decreased to satisfy the particular needs and requirements of the student. No research report or thesis is required.

Curriculum

The program contains a core curriculum of 12 quarter-hour credits of required courses and 12 quarter-hour credits to be selected from an elective core consisting of six hours of administrative courses and six hours of therapeutic courses. The total of the required and elective core components is 24 quarter hours of credit. In addition, 16 hours are to be selected from those graduate courses offered by divisions in the University. These latter courses are to be selected with the guidance of the Director of the M.S. program in Hospital Pharmacy.

<i>Required Courses</i>		<i>Credits</i>
71.815 Biopharmaceutics and Pharmacokinetics		2
71.822 Project Seminar and Report in Hospital Pharmacy		2
71.844 Hospital Pharmacy Administration I		2
71.845 Hospital Pharmacy Administration II		2
71.846 Hospital Pharmacy Administration III		2
71.854 Clinical Pharmacy		2
	QUARTER HOURS	12
<i>Elective Core</i>		
<i>Administrative Core</i>		
71.823 Legal Aspects/Federal Legislation in Pharmacy		2
71.852 Health Care Administration I		2
71.853 Health Care Administration II		2
71.855 Human Relations		2
71.856 Data Processing		2
71.863 Clinical Problem Solving		2
	QUARTER HOURS	6
<i>Therapeutic Courses</i>		
71.858 Contemporary Therapeutics I		2
71.859 Contemporary Therapeutics II		2
71.860 Drug Monitoring		2
71.861 Sterile Products		2
71.862 Hospital Preparations		2
	QUARTER HOURS	6
Total Required Courses and Elective Core Electives		24
		16
TOTAL PROGRAM (quarter hours):		40

Elective Courses

Taken with the approval of the Director of the M.S. program in Hospital Pharmacy and the course instructor. Selection may be made from the following and other appropriate graduate courses in the Graduate School of Pharmacy and Allied Health Professions or in the rest of the University.

5.860	Health Care Organization and Management	2
39.9H1	Economics of Medical Care and Health Manpower	3
41.816	Management Control of Health Service Systems	3
45.838	Policy Formation in Health Care	3
72.834	Clinical Chemistry I	2
72.835	Clinical Chemistry II	2
73.814	Concepts in Pharmacology I	2
73.815	Concepts in Pharmacology II	2
73.816	Concepts in Toxicology I	2
73.817	Concepts in Toxicology II	2
73.844	Drug Metabolism	2
73.845	Radioisotopes in Biological Systems	2



SAMPLE PROGRAM

MASTER OF SCIENCE IN HOSPITAL PHARMACY

YEAR 1		Spring Quarter		Spring Quarter	
Fall Quarter		Winter Quarter		Winter Quarter	
71.844 Hospital Pharmacy Administration	2	71.845 Hospital Pharmacy Administration II	2	71.846 Hospital Pharmacy Administration III	2
71.854 Clinical Pharmacy	2	71.858 Contemporary Therapeutics I	2	71.859 Contemporary Therapeutics II	2
Summer Quarter					
71.822 Project Seminar and Research Report in Hospital Pharmacy	2				
YEAR 2		Spring Quarter		Spring Quarter	
Fall Quarter		Winter Quarter		Winter Quarter	
71.852 Health Care Administration I	2	71.853 Health Care Administration	2	71.855 Human Relations	2
71.860 Drug Monitoring	2	71.861 Sterile Products	2	71.862 Hospital Preparations	2
YEAR 3		Spring Quarter		Spring Quarter	
Fall Quarter		Winter Quarter		Winter Quarter	
71.815 Biopharmaceutics and Pharmacokinetics	2	71.856 Data Processing	2	71.863 Clinical Problem Solving	2
71.823 Legal Aspects/Federal Legislation in Pharmacy	2		4		4
ELECTIVES		Elective		Elective	
Fall Quarter		Winter Quarter		Winter Quarter	
5.860 Health Care Organization and Management	2	39.9H1 Economics of Medical Care and Health Manpower	2	73.845 Radioisotopes in Biological Systems	2
41.816 Management Control of Health Service Systems	3	72.835 Clinical Chemistry II	2		
72.834 Clinical Chemistry I	2	73.815 Concepts in Pharmacology II	2		
73.814 Concepts in Pharmacology I	2	73.817 Concepts in Toxicology II	2		
73.816 Concepts in Toxicology I	2	73.844 Drug Metabolism	2		

PART-TIME MASTER OF SCIENCE DEGREE PROGRAM IN MEDICAL LABORATORY SCIENCE

Objectives

This program provides opportunity for medical laboratory scientists to acquire increased expertise in laboratory science and in clinical laboratory research and development.

The graduate of this program will contribute significantly to the modern medical laboratory. He should be able to search the literature to find and test available methodologies, and to develop, modify, and evaluate new methods. He should be a qualified associate in the clinical pathology department. The graduate courses in administration and education prepare the student for administrative or teaching responsibilities required in medical laboratory supervisory or educative positions.

Admission and Program Features

To be enrolled for graduate work, the applicant must hold a baccalaureate degree from a recognized institution and provide evidence that he is able to pursue a program of graduate study as determined by the Graduate Committee. His scholastic record must show distinction, with adequate preparation in the sciences, including one year of organic chemistry, college physics, and mathematics; one term of analytical chemistry; and a minimum of 24 quarter hours or the equivalent of biological sciences including basic microbiology, human physiology, genetics, and cell biology. Requirements in human physiology, genetics, and cell biology may be completed at the graduate level. Students admitted with deficiencies must remove them during the first 20 quarter hours of graduate work.

Acceptance to the school is upon recommendation of the Medical Laboratory Science Graduate Committee and approval by the Graduate Committee of the Graduate School of Pharmacy and Allied Health Professions. It is anticipated that students may complete the degree requirements in a minimum of three years. However, in some cases this may be increased or decreased to satisfy a student's particular needs and requirements.

Professional Requirement

At the completion of the Master of Science degree, the student must have written, or be eligible to write, the examination in medical technology or in one of the categorical or specialist certifications of the Board of Registry of the American Society of Clinical Pathologists. He must also have worked at least one year in a clinical laboratory as a medical laboratory scientist.

Curriculum

The program contains a core curriculum of 27 quarter-hour credits of required courses and eight quarter-hour credits selected from an

elective core. The total of the required and elective core components is 35 quarter hours of credit. In addition, eight hours are to be selected from those graduate courses offered by the Graduate School of Pharmacy and Allied Health Professions or by other divisions in the University. These latter courses are to be selected with the guidance of the Director of the M.S. program in Medical Laboratory Science.

<i>Required Courses</i>	<i>Credits</i>
87.801 Advanced Medical Laboratory Science—Pathogenic Microbiology	4
87.802 Advanced Medical Laboratory Science—Hematology and Immunohematology	4
87.805 Advanced Medical Laboratory Science—Chemistry and Instrumentation	4
87.807 Biometrics	2
87.811 Pathophysiology I	2
87.812 Pathophysiology II	2
87.990 Graduate Research Report I	2
90.821 Biochemistry I	2
90.822 Biochemistry II	2
Seminars (3): 1 quarter hour each (87.890 or from other graduate programs)	3
QUARTER HOURS	27

Students who are registered M.T. (ASCP) and who have completed the equivalent of 87.801, 87.802 and 87.805 within the previous five years, and are currently working in the speciality, should petition to substitute appropriate graduate science courses. Approval of adviser is required.

Elective Core

A minimum of eight credits must be taken from the following list:

18.240	Microbial Physiology	4
73.814	Concepts in Pharmacology I	2
73.815	Concepts in Pharmacology II	2
73.845	Radioisotopes in Biological Systems	2
87.821	Medical Laboratory Management I	2
87.826	Health Science Education I	2
87.832	Hematology I	2
87.833	Immunobiology	2
87.845	Epidemiology	2
87.858	Cellular Pathology	2
90.823	Biochemistry III	2

Elective Courses

Selection may be made from other courses in the elective core or from the following. Students may choose all electives in one area: i.e., the laboratory sciences, health science education, or laboratory administration.

18.211	Parasitology	4
18.242	Medical Microbiology	2
18.245	Serology—Immunology	3
18.246	Serology—Immunology Laboratory	2
18.901	Microbial Genetics	3
18.903	Environmental Microbiology	4
18.905	Marine Microbiology	4
18.907	Food Microbiology	2
18.909	Animal Virology	4
18.915	Medical Mycology	2
18.940	Microbial Biochemistry	4
19.838	Human Learning and Cognition	3
21.840	Sociology of Medicine	3
21.843	Sociology of Education	3
21.847	Formal Organizations	3
21.850	Sociology of Occupations and Professions	3
21.910	The Sociology of Science	3
22.876	Administrative Behavior	3
22.879	Science, Technology, and the Administration of Public Policy	3
39.9G7	Public Policy in Manpower	3
39.9H1	Economics of Medical Care and Health Manpower	3
39.9H3	Economics of Education	3
50.815	Research Design in Education	2
50.817	Research Problems in Education	2
71.852	Health Care Administration I	2
71.853	Health Care Administration II	2
71.855	Human Relations	2
72.834	Clinical Chemistry I	2
72.835	Clinical Chemistry II	2
72.863	Anti-infectives	2
72.864	Cancer Therapy and Carcinogenesis	2
73.816	Concepts in Toxicology I	2
73.817	Concepts in Toxicology II	2
73.818	Special Topics in Pharmacology	2
73.844	Drug Metabolism	2
87.803	Medical Immunology and Serology	2
87.804	Medical Parasitology	2
87.810	Functions of the Human Systems	2

SAMPLE PROGRAM
MASTER OF SCIENCE IN MEDICAL LABORATORY SCIENCE

YEAR 1	YEAR 2	YEAR 3
<i>Fall Quarter</i> 87.802 Advanced MLS Hematology and Immunohematology	<i>Winter Quarter</i> 87.805 Advanced MLS Clinical Chemistry Elective (i.e. 87.803)	<i>Spring Quarter</i> 4 87.801 Advanced MLS Pathogenic Microbiology Elective (i.e. 87.804)
<i>Fall Quarter</i> 87.807 Biometrics 90.821 Biochemistry I	<i>Winter Quarter</i> 2 87.811 Pathophysiology I 2 90.822 Biochemistry II	<i>Spring Quarter</i> 2 87.812 Pathophysiology II 2 87.890 Seminar 1
<i>Fall Quarter</i> 87.990 Graduate Research I Elective Seminar	<i>Winter Quarter</i> 2 87.890 Seminar 2 1	<i>Spring Quarter</i> 1 2 2

ELECTIVES

Fall Quarter			Spring Quarter			
Winter Quarter			Summer Quarter			
18.211 Parasitology	4	18.211 Parasitology	4	18.903 Environmental Microbiology	4	
18.901 Microbial Genetics	3	18.242 Medical Microbiology	2	18.905 Marine Microbiology	4	
18.909 Animal Virology	4	18.245 Immunology and Seriology	3	18.907 Food Microbiology	2	
50.815 Research Design in Education	2	18.246 Immunology and Seriology Laboratory	2	18.915 Medical Mycology	2	
72.834 Clinical Chemistry I	2	39.9H1 Economics of Medical Care	3	18.940 Microbial Biochemistry	4	
72.863 Anti-infectives	2	2	39.9H1 Economics of Medical Care	3	19.838 Human Learning and Cognition	3
73.816 Concepts in Toxicology I	2	50.815 Research Design in Education	2	21.840 Sociology of Medicine	3	
87.802 Advanced MLS Hematology and Immunohematology	2	50.817 Research Problems in Education	2	22.876 Administrative Behavior	3	
87.803 Medical Immunology and Serology	2	71.852 Health Care Administration I	2	39.9G7 Public Policy in Manpower	3	
87.807 Biometrics	2	72.835 Clinical Chemistry II	2	50.815 Research Design in Education	2	
87.810 Functions of the Human Systems	2	73.817 Concepts in Toxicology II	2	71.853 Health Care Administration II	2	
87.826 Health Science Education I	2	73.844 Drug Metabolism	2	72.864 Cancer Therapy and Carcinogenesis	2	
87.990 Graduate Research Report I	2	87.804 Medical Parasitology	2	73.818 Special Topics in Pharmacology	2	
87.991 Graduate Research Report II	2-6	87.805 Advanced MLS Clinical Chemistry and Instrumentalism	4	87.801 Advanced MLS Pathogenic Microbiology	4	
		87.811 Pathophysiology I	2	87.812 Pathophysiology II	2	
		87.821 Medical Laboratory Management I	2	87.822 Medical Laboratory Management II	2	
		87.827 Health Science Education II	2	87.828 Health Science Education III	2	
		4	87.845 Epidemiology	2	87.833 Immunobiology	2
		4	87.990 Graduate Research Report I	2	87.843 Immunobiology Laboratory	2
		2	87.991 Graduate Research Report II	2	87.990 Graduate Research Report I	2
		2	87.991 Graduate Research Report II	2	87.991 Graduate Research Report II	2
				90.823 Biochemistry III		

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87.822	Medical Laboratory Management II	2
87.823	Immunohematology	2
87.827	Health Science Education II	2
87.828	Health Science Education III	2
87.842	Hematology II	2
87.843	Immunobiology Laboratory	2
87.852	Hematology III	2
87.991	Graduate Research Report II	2-6
90.823	Biochemistry III	2

PART-TIME MASTER OF SCIENCE DEGREE PROGRAM IN MEDICINAL CHEMISTRY

Objectives

The primary goal of this program is the education of professionals interested in the following areas: the rational development, isolation, and analysis of drugs; the understanding of the chemical mechanisms by which these compounds function in mammalian systems; and the metabolism of such biologically active agents. For this purpose the program is composed of four distinct areas of study: medicinal chemistry, pharmacology and toxicology, biochemistry, and organic chemistry. This type of background gives preparation to an individual interested in using chemistry for biological and clinical purposes. The medical research team needs scientists with this training and orientation.

Admission and Program Features

Application for admission to this program is welcomed from any individual who has obtained a baccalaureate degree in pharmacy, chemistry, biology, and related programs within the biological or physical sciences from a recognized institution. Further, his undergraduate record must indicate a high level of previous work and sufficient background in organic chemistry, mathematics, and biology. Applicants with deficiencies in these areas may be admitted as Special Students. Students admitted with deficiencies must remove them during the first 12 quarter hours of graduate work.

The program is available on a part-time basis, with courses offered primarily during the evening hours. Courses are scheduled in the fall, winter, spring, and summer quarters. It is anticipated that students may complete the degree requirement in a minimum of three years; however, in some cases the duration may be increased or decreased to satisfy the particular needs and requirements of the student. No research report or thesis is required.

The Graduate School recognizes the divergent backgrounds and goals of individuals who may be accepted into this program. Accordingly, the program is designed to offer flexibility in course selection so as to maximize its relevance to the student's career objective.

General Requirements

A candidate must complete a minimum of 40 quarter hours of graduate work. A total of 24 required credits must be taken: 10 quarter hours of medicinal chemistry courses, six quarter hours of pharmacology and toxicology, four quarter hours of biochemistry and related areas, and four quarter hours of organic chemistry. The balance of the 40 hours may be taken from an elective list.

An individual who has deficiencies in any of the areas required for admission may take appropriate courses at Northeastern University concurrently with those graduate courses which do not require the deficient prerequisites. The appropriate evening courses offered at University College of Northeastern University are: Analytical Chemistry 12.521-12.526; Organic Chemistry 12.531-12.533; Physical Chemistry 12.541-12.543; and Human Anatomy and Physiology 18.524-18.526. Equivalent courses from this University or other accredited universities will be accepted.

Curriculum

Required Courses

1. Medicinal Chemistry from the following courses:

Minimum Credits

72.861	CNS Drugs	2
72.862	Autonomic Drugs	2
72.863	Anti-infectives	2
72.864	Cancer Therapy and Carcinogenesis	2
72.865	Special Topics in Medicinal Chemistry I	2
72.866	Phytochemistry	2

2. Pharmacology and Toxicology from the following courses:

6 quarter hours

73.814	Concepts in Pharmacology I	2
73.815	Concepts in Pharmacology II	2
73.816	Concepts in Toxicology I	2
73.817	Concepts in Toxicology II	2
73.818	Special Topics in Pharmacology	2

3. Biochemistry, Clinical Chemistry, and Drug Metabolism from the following courses:

4 quarter hours

72.834	Clinical Chemistry I	2
72.835	Clinical Chemistry II	2
73.844	Drug Metabolism	2
90.821	Biochemistry I	2
90.822	Biochemistry II	2
90.823	Biochemistry III	2

4. Organic Chemistry from the following courses: 4 quarter hours

12.861	Advanced Organic Chemistry I	2
12.862	Advanced Organic Chemistry II	2
12.863	Physical Organic Chemistry	2
12.864	Stereochemistry I	2
12.865	Stereochemistry II	2
12.866	Spectrometric Identification of Organic Compounds	2
12.876	Mechanisms of Organic Reactions I	2
12.877	Mechanisms of Organic Reactions II	2
5.	72.867 Medicinal Chemistry Seminar	2 quarter hours

TOTAL CREDITS

24

Elective Courses

Taken with the approval of the Director of the M.S. program in Medicinal Chemistry. Selection may be made from the above courses or other appropriate graduate courses in the Graduate School of Pharmacy and Allied Health Professions or in the University.

12.821	Analytical Separations	2
12.823	Optical Methods of Analysis	2
12.827	Computers in Chemistry	2
12.846	Coordination Chemistry	2
18.242	Medical Microbiology	4
18.835	Mammalian Physiology	4
18.840	Comparative Physiology of Regulatory Mechanisms	2
18.842	Vertebrate Endocrinology	2
18.843	Procedures in Endocrinology	3
18.860	Cell Biophysics and Biochemistry	5
18.905	Marine Microbiology	4
18.909	Animal Virology	4
18.940	Microbial Biochemistry	2
72.812	Advanced Drug Synthesis	2
72.836	Special Topics in Clinical Chemistry	2
73.845	Radioisotopes in Biological Systems	2
87.807	Biometrics	4

A minimum total of 40 quarter hours is required for completion of the M.S. in Medicinal Chemistry.

SAMPLE PROGRAM

MASTER OF SCIENCE IN MEDICINAL CHEMISTRY

PART-TIME MASTER OF SCIENCE DEGREE PROGRAM IN PHARMACOLOGY

Objectives

The pharmacologist is concerned with the discovery, testing, and perfecting of drugs and the study of how they act, especially in mammalian systems. With the increasing concern of pharmaceutical companies, hospitals, and research institutions for knowledge of the mechanisms by which drugs produce their effects, the role of the pharmacologically trained scientist is ever expanding. In the education of such an individual, a broad background in pharmacology, physiology, anatomy, instrumentation, and chemistry is essential. The goal of Northeastern's program is to meet this objective and to prepare individuals to make significant contributions in the many areas requiring pharmacological expertise.

Admission and Program Features

Application for admission as a graduate student is welcomed from any individual who has obtained a baccalaureate degree in pharmacy, chemistry, biology, or related programs within the biological or physical sciences from a recognized institution. Further, the applicant's undergraduate record must indicate sufficient background in organic chemistry, mathematics, and biology. However, applicants with deficiencies in these areas may be admitted as Special Students. Students admitted with deficiencies must remove them during the first 12 quarter hours of graduate work.

The program is available on a part-time basis, with courses offered primarily during the evening hours. Courses are scheduled in the fall, winter, spring, and summer quarters. It is anticipated that students may complete the degree requirements in a minimum of three years. However, the duration may be longer or shorter, depending upon the particular student. No research report or thesis is required.

The Graduate School recognizes the divergent background and goals of individuals who may be accepted into this program. Accordingly, the program is designed to offer flexibility in course selection so as to maximize its relevance to the student's career objectives.

General Requirements

A candidate must complete a minimum of 40 quarter hours of graduate work. A total of 24 required credits must be taken: 16 quarter hours within the Pharmacology sequence and eight quarter hours from the Chemistry sequence. The balance of the 40 quarter hours may be selected from graduate courses in the Graduate School of Pharmacy and Allied Health Professions or in other divisions of the University. Selection of the elective courses should be made with the approval of the Director of the M.S. program in Pharmacology.

Curriculum -**Required Courses****1. Pharmacology Sequence**

	<i>Minimum</i>	<i>Credit</i>
	16 quarter hours	
73.814 Concepts in Pharmacology I	2	
73.815 Concepts in Pharmacology II	2	
73.816 Concepts in Toxicology I	2	
73.817 Concepts in Toxicology II	2	
73.818 Special Topics in Pharmacology	2	
73.844 Drug Metabolism	2	
73.845 Radioisotopes in Biological Systems	2	
90.821 Biochemistry I	2	

2. Chemistry Sequence

8 quarter
hours

72.834 Clinical Chemistry I	2
72.835 Clinical Chemistry II	2
72.861 CNS Depressants	2
72.862 Autonomic Drugs	2
72.863 Anti-infectives	2
72.864 Cancer Therapy and Carcinogenesis	2
72.865 Special Topics in Medicinal Chemistry I	2
72.866 Phytochemistry	2
90.822 Biochemistry II	2
90.823 Biochemistry III	2

3. Elective Courses

These are to be selected from the above courses, as well as from other appropriate graduate courses in the University.

SAMPLE PROGRAM
MASTER OF SCIENCE IN PHARMACOLOGY

YEAR 1			
YEAR 2			
YEAR 3			
<i>Fall Quarter</i> 73.816 Concepts in Toxicology I 90.821 Biochemistry I	<i>Winter Quarter</i> 2 73.817 Concepts in Toxicology II 2 90.822 Biochemistry II	<i>Spring Quarter</i> 2 90.823 Biochemistry III	
<i>Fall Quarter</i> 72.863 Anti-infectives 73.814 Concepts of Pharmacology I	<i>Winter Quarter</i> 2 72.862 Autonomic Drugs 2 73.815 Concepts of Pharmacology II	<i>Spring Quarter</i> 2 72.861 CNS Depressants 2 73.818 Special Topics in Pharmacology	
<i>Fall Quarter</i> 72.834 Clinical Chemistry I 72.866 Phytochemistry	<i>Winter Quarter</i> 2 72.844 Drug Metabolism 2 72.865 Special Topics in Medicinal Chemistry	<i>Spring Quarter</i> 2 72.835 Clinical Chemistry II 2 72.864 Cancer Therapy and Carcinogenesis 2 73.845 Radioisotopes in Biological Systems	
<i>Summer Quarter</i> 72.867 Medicinal Chemistry Seminar			2

PART-TIME MASTER OF SCIENCE DEGREE PROGRAM IN RADIOPHARMACEUTICAL SCIENCE

Objectives

During the last decade many new experimental tools and methods have been placed in the hands of professionals and practitioners in the allied health professions. These have been used to probe more widely and more deeply into the nature of man's clinical problems. Of all the new techniques, none has been employed in more diverse means nor yielded greater rewards than the use of radioactive isotopes for both diagnostic and therapeutic procedures.

There is a critical need for individuals with background and training in the area of radiopharmaceuticals and radiochemicals. They will be employed in the pharmaceuticals industry, in hospitals, and in various clinical and chemical laboratories. The function of this program is to supply the in-depth knowledge necessary for the education of such professionals.

Admission and Program Features

Applicants for this program must have completed a baccalaureate program in biology, chemistry, medical technology, pharmacy, or a related field. Undergraduate requirements are: a minimum of two quarters of organic chemistry, one quarter of analytical chemistry or its equivalent, two quarters of human physiology, and one quarter of physical chemistry. An individual who has deficiencies in any of these areas may take appropriate courses at Northeastern University or at any other recognized institution concurrently with those graduate courses which do not require the deficient prerequisites. Students admitted with deficiencies must remove them during the first 12 quarter hours of graduate work.

The program is available on a part-time basis, with courses offered primarily during the evening hours. Courses are scheduled in the fall, winter, spring, and summer quarters. It is anticipated that students may complete the degree requirements in a minimum of three years; however, in some cases the duration may be increased or decreased to satisfy the particular needs and requirements of the student. No research report or thesis is required.

The Graduate Committee recognizes the divergent backgrounds and goals of individuals who may be accepted into this program. Accordingly, the program is designed to offer flexibility in course selection so as to maximize its relevance to the student's career objectives. Each student is assigned a faculty adviser who assists him in course selection and apprises him of those offerings which will strengthen his background in the areas of his interest. In essence, this adviser functions in tailor making the program for the student's individual needs.

Curriculum

<i>Required Courses</i>	<i>Credits</i>
10.8H1 Biostatistics	2
11.871 Radiation Physics I	2
11.872 Radiobiology and Health Physics	2
12.807 Applications of Radiochemistry	2
72.840 Nuclear Medicine I	2
72.841 Nuclear Medicine II	2
72.842 Radioisotopic Instrumentation	2
72.843 Radioisotopic Application	2
73.844 Drug Metabolism	2
90.821 Biochemistry I	2
<hr/>	
QUARTER HOURS	20

Elective Core

A minimum of 10 credits must be taken from the following list:

12.827 Computers in Chemistry	2
12.828 Chemical Instrumentation	2
72.834 Clinical Chemistry I	2
72.835 Clinical Chemistry II	2
72.844 Seminar and Research Report in Radiopharmaceutical Science	2
72.861 CNS Depressants	2
72.863 Anti-infectives	2
73.814 Concepts in Pharmacology I	2
73.815 Concepts in Pharmacology II	2
73.816 Concepts in Toxicology I	2
73.817 Concepts in Toxicology II	2
90.822 Biochemistry II	2
90.823 Biochemistry III	2

Additional Electives

These are to be taken with the approval of a faculty adviser in the Department of Medicinal Chemistry and Pharmacology in the College of Pharmacy and Allied Health Professions and the course instructor. Selection may be made from the above courses, as well as from the following and from other appropriate graduate courses in the University. Course availability is subject to change.

12.841 Inorganic Chemistry I	2
12.842 Inorganic Chemistry II	2
12.846 Coordination Chemistry	2
12.861 Advanced Organic Chemistry I	2
12.862 Advanced Organic Chemistry II	2
12.863 Theoretical Organic Chemistry	2
12.866 Spectrometric Identification of Compounds	2
12.881 Thermodynamics I	2
12.885 Atomic and Molecular Structure I	2

12.893	Kinetics	2
18.245	Serology—Immunology	3
18.835	Mammalian Physiology	4
18.840	Comparative Physiology of Regulatory Mechanisms	2
18.842	Vertebrate Endocrinology	2
18.843	Procedures in Endocrinology	3
18.960	Cell Biophysics and Biochemistry I	5
18.861	Cell Biophysics and Biochemistry II	5
18.909	Animal Virology	4
72.864	Cancer Therapy and Carcinogenesis	2
72.865	Special Topics in Pharmacology	2
72.866	Phytochemistry	2
72.867	Medicinal Chemistry Seminar	2
73.818	Special Topics in Pharmacology	2
73.819	Pharmacological Instrumentation	2
87.805	Advanced MLS—Chemistry and Instrumentation	4
87.811	Pathophysiology I	2
87.812	Pathophysiology II	2
87.833	Immunobiology	2
87.834	Immunobiology Laboratory	2

A minimum total of 40 quarter hours of graduate credit is necessary for completion of the Master of Science degree in Radiopharmaceutical Science.

SAMPLE PROGRAM
MASTER OF SCIENCE IN RADIOPHARMACEUTICAL SCIENCE

YEAR 1

<i>Fall Quarter</i>	<i>Winter Quarter</i>	<i>Spring Quarter</i>
11.871 Radiation Physics	2 11.872 Radiobiology and Health Physics	2 10.8H1 Biostatistics
Elective	2	2 12. Applications of Radiochemistry
YEAR 2		
<i>Fall Quarter</i>	<i>Winter Quarter</i>	<i>Spring Quarter</i>
72.840 Nuclear Medicine I	2 72.841 Nuclear Medicine II	2 72.844 Seminar and Research Report in
90.821 Biochemistry I	2 73.844 Drug Metabolism	2 Radiopharmaceutical Science
	90.822 Biochemistry II	2 90.823 Biochemistry III
YEAR 3		
<i>Fall Quarter</i>	<i>Winter Quarter</i>	<i>Spring Quarter</i>
72.842 Radioisotopic Instrumentation	2 72.843 Radioisotopic Application	2 Electives
Electives	2	2

ELECTIVES

<i>Fall Quarter</i>	<i>Winter Quarter</i>	<i>Spring Quarter</i>
12.827 Computers in Chemistry	2 12.828 Chemical Instrumentation	2 12.846 Coordination Chemistry
12.841 Inorganic Chemistry I	2 12.842 Inorganic Chemistry II	2 12.863 Theoretical Organic Chemistry
12.861 Advanced Organic Chemistry I	2 12.862 Advanced Organic Chemistry II	2 12.866 Spectrometric Identification of
12.881 Thermodynamics I	2 12.885 Atomic and Molecular Structure I	2 Compounds
18.842 Vertebrate Endocrinology	2 18.245 Serology—Immunology	3 12.893 Kinetics
18.909 Animal Virology	4 18.835 Mammalian Physiology	4 18.840 Comparative Physiology of
72.834 Clinical Chemistry I	2 18.860 Cell Biophysics and Biochemistry I	5 Regulatory Mechanisms
72.863 Anti-infectives	2 72.835 Clinical Chemistry II	2 18.843 Procedures in Endocrinology
72.866 Phytochemistry	2 72.865 Special Topics in Pharmacology	3 Cell Biophysics and Biochemistry II
73.814 Concepts in Pharmacology I	2 73.815 Concepts in Pharmacology	2 18.861 Seminar and Research Report in
73.816 Concepts in Toxicology II	2 73.817 Concepts in Toxicology I	2 Radiopharmaceutical Science
	2 87.805 Advanced MLS—Chemistry and	2 CNS Depressants
	Instrumentation	2 72.864 Cancer Therapy and Carcinogenesis
	87.811 Pathophysiology I	2 73.818 Special Topics in Pharmacology
		2 87.812 Pathophysiology II
		2 87.833 Immunobiology
		2 87.834 Immunobiology Laboratory

Summer Quarter
 72.867 Medicinal Chemistry Seminar

FULL-TIME DOCTOR OF PHILOSOPHY DEGREE PROGRAM IN MEDICINAL CHEMISTRY

Objectives

The purpose of this program is to educate the research scientist interested in applying chemistry to the solution of biological and medical problems. Such research may take the form of synthesizing new drugs—both radioactive and nonradioactive—for diagnosis and a variety of disease conditions, determining metabolic products derived from compounds of an endogenous or exogenous origin, elucidating various biochemical pathways, developing and utilizing analytical methodologies for drugs and various biochemical compounds, and isolating drugs from natural sources. These are a few of the types of research projects which are available within the Department of Medicinal Chemistry and Pharmacology.

In addition to the student's demonstration of superior proficiency in original research, he must acquire the background knowledge via courses and outside reading in the current scientific literature in medicinal chemistry to complete the qualifying examination satisfactorily. For this purpose, a working knowledge of at least one foreign language is required. Any student who wishes to pursue the doctorate must write directly to the Director of the Ph.D. program in Medicinal Chemistry.

Admission and Program Features

Application for admission is welcomed from any individual who has obtained a baccalaureate degree in pharmacy, chemistry, biology, medical laboratory science, and related programs within the biological or physical sciences from a recognized accredited institution. Further, the undergraduate record must indicate a very high level of previous work and sufficient background in organic chemistry, mathematics, and biology. Deficiencies in these areas must be removed within the first academic year. Admission to this program is by acceptance of the Graduate Committee of the College of Pharmacy and Allied Health Professions. A student is considered to be in the doctoral program after being accepted, but not before taking up full-time residence.

Course Requirements

There are no specific course requirements beyond those which may be required for a master's degree in Medicinal Chemistry, but in order for a student to be completely prepared for both the research program and the qualifying examination, the following course background is desirable.

COURSES

		Quarter hour
1.	<i>Medicinal Chemistry</i>	
72.861	CNS Drugs	2
72.862	Autonomic Drugs	2
72.863	Anti-infectives	2
72.864	Cancer Therapy and Carcinogenesis	2
72.865	Special Topics in Medicinal Chemistry I	2
72.866	Phytochemistry	2
72.867	Medicinal Chemistry	2
2.	<i>Pharmacology</i>	
73.814	Concepts in Pharmacology I	2
73.815	Concepts in Pharmacology II	2
73.816	Concepts in Toxicology I	2
73.817	Concepts in Toxicology II	2
73.818	Special Topics in Pharmacology	2
3.	<i>Biochemistry</i>	
72.834	Clinical Chemistry I	2
72.835	Clinical Chemistry II	2
73.844	Drug Metabolism	2
90.821	Biochemistry I	2
90.822	Biochemistry II	2
90.823	Biochemistry III	2
4.	<i>Organic Chemistry</i>	
12.253	Identification of Organic Compounds	3
12.861	Advanced Organic Chemistry I	2
12.862	Advanced Organic Chemistry II	2
12.863	Theoretical Organic Chemistry	2
12.864	Stereochemistry I	2
12.865	Stereochemistry II	2
12.866	Spectrometric Identification of Organic Compounds	2
12.876	Mechanisms of Organic Reactions I	2
12.877	Mechanisms of Organic Reactions II	2
5.	<i>Physical Chemistry</i>	
12.541	Physical Chemistry I	2
12.542	Physical Chemistry II	2
12.543	Physical Chemistry III	2

Selection of all courses must be approved by the student's adviser or the Director of the Ph.D. program in Medicinal Chemistry. For further information about degree candidacy, qualifying examination, dissertation, language requirements, and final oral examinations for the Doctor of Philosophy degree, consult the general regulations beginning on page 29.

COURSES

DESCRIPTION OF COURSES

5.800 See Graduate School of Engineering Catalog

10.8H1 Biostatistics (2 q.h.)

An introduction to the use of statistical techniques as applied to problems in the life sciences. Topics include: measures of central tendency and deviation, probability distributions, estimation and hypothesis testing, correlation and regression analysis, and analysis of variance.

11.871 Radiation Physics (2 q.h.)

The fundamental particles, the nucleus, spontaneous radioactive transformation, nuclear reactions, fission and nuclear reactors, the natural radioelements, the transuranium series, isotope effects and the separation of isotopes, and dissipation of the energy of radiation in matter. *Prep. Undergraduate Physics.* Yearly, Fall Quarter

11.872 Radiobiology and Health Physics (2 q.h.)

The biological effects of ionizing radiation. Included is a discussion of elementary target theory, radiation chemistry, effects on macromolecules, cellular and chromosomal effects, recovery processes, and the acute and long-term effects of radiation with emphasis on man, as well as a discussion of environmental sources of radiation and the characteristics of internal and external human exposure. *Prep. 11.871.* Yearly, Winter Quarter

12.807 Applications of Radiochemistry (2 q.h.)

Topics discussed include: isotopic exchange, hot-atom chemistry, activation analysis, isotope production, counting statistics, electrochemical applications, separation techniques, uses of radionuclides in the studies of the mechanisms of chemical reactions, application techniques. *Prep. 11.871.* Yearly, Spring Quarter

12.253 Identification of Organic Compounds (3 q.h.)

Qualitative analysis of organic compounds and mixtures, using physical, chemical, and instrumental methods. *Prep. 12.155.*

Yearly, Spring and Summer Quarters

12.500 See University College Catalog

12.821 Analytical Separations (2 q.h.)

Theory and practice of analytical separation techniques. Emphasis on fundamentals as they relate to practice. Topics based mainly on chromatographic processes, including gas and high-speed liquid chromatography. Other topics include: zone refining, liquid extraction and electrophoresis.

Yearly, Fall Quarter

12.822 Electroanalytical Chemistry (2 q.h.)

The principles and practice of electroanalytical chemistry. Topics include: potentiometry and ion-selective electrodes, normal and thin-layer coulometry, polarography, and electrochemical relaxation methods. Application of these techniques to titration endpoint detection

Yearly, Winter Quarter

12.823 Optical Methods of Analysis (2 q.h.)

The theory and practice of absorption and emission spectroscopy. Instruments, methods, and applications are considered.

Yearly, Spring Quarter

12.824, 12.825, 12.826 Special Topics in Analytical Chemistry I, II, III (2 q.h.)

Selected topics of current importance in analytical chemistry.

Yearly, Fall, Winter, and Spring Quarters

12.827 Computers in Chemistry (2 q.h.)

A laboratory-lecture course illustrating the use of small digital computers for real-time control of chemical instruments. Topics include: digital logic, real-time data structures, A/D and D/A conversion noise, and other aspects of real-time computer interfacing. Programming done on a PDP-11 computer in MIRACL, a language designed for real-time processing. *Prep. consent of instructor.* Yearly, Fall Quarter

12.828 Chemical Instrumentation (2 q.h.)

Principles of instrument design considered, with emphasis on practical aspects. Instrument limitations and sources of error studied, along with modular instruments and interfacing. *Prep. consent of instructor.*

Yearly, Winter Quarter

12.861, 12.862 Advanced Organic Chemistry I, II (2 q.h.)

An intensive survey of organic reactions. Modern concepts of structure and mechanism are used to correlate factual material. *Prep. one year of Organic Chemistry.*

Yearly, Fall and Winter Quarters

12.863 Physical Organic Chemistry (2 q.h.)

Application of LCAO concepts, linear free energy relationships, interactions between solvent effects, steric considerations, and electronic factors, and introduction to orbital symmetry direction of concerted reactions. *Prep. 12.862 or consent of instructor.*

Yearly, Spring Quarter

12.864, 12.865 Stereochemistry I, II (2 q.h.)

Interrelation of steric arrangements of atoms in organic molecules with their physical and chemical properties. Conformational analysis. Spatial

relationships between atoms and groups during chemical reactions and consequent effects on chemical equilibria and reaction rates as an introduction to the study of reaction mechanisms. *Prep. 12.863.*

Yearly, Fall and Winter Quarters

**12.866 Spectrometric Identification of Organic Compounds
(2 q.h.)**

Interpretation of the ultraviolet, infrared, nuclear magnetic resonance and mass spectra of organic compounds. *Prep. one year of Organic Chemistry.*

Yearly, Spring Quarter

12.876, 12.877 Mechanisms of Organic Reactions I, II (2 q.h.)

Consideration of the fundamental factors influencing the course of a chemical reaction. Study of the effects of structural and environmental changes on the mechanisms of organic reactions. *Prep. 12.865.*

Yearly, Winter and Spring Quarters

12.800 See Graduate School of Arts and Sciences Catalog

18.200 See Undergraduate Catalog

18.240 Microbial Physiology (4 q.h.)

The biochemical changes brought about through microbial activities; measurement of metabolic biosynthesis and degradation, rates of reaction and determination of end products. *Prep. 18.220.*

Yearly, Fall and Winter Quarters

18.800 See Graduate School of Arts and Sciences Catalog

19.800 See Graduate School of Arts and Sciences Catalog

21.800 See Graduate School of Arts and Sciences Catalog

39.900 See Graduate School of Arts and Sciences Catalog

41.800 See Graduate School of Business Administration Catalog

45.800 See Graduate School of Business Administration Catalog

50.800 See Graduate School of Education Catalog

71.815 Biopharmaceutics and Pharmacokinetics (2 q.h.)

Treatment of the factors affecting drug availability from various dosage forms. Included is the influence of the route of administration and the dosage regimen on drug availability. Additionally, a quantitative treatment of dynamics of drug absorption, distribution, metabolism, and excretion, as well as the development of mathematical models for those processes, is considered. *Prep. admission to hospital pharmacy program.*

Yearly, Fall Quarter

71.822 Project Seminar and Report in Hospital Pharmacy (2 q.h.)

Seminar on current developments or specific problems in hospital pharmacy which have been studied in depth by students with guidance from the graduate faculty. The student presentations may be alternated with guest speakers on topics of current interest. Student participation in the discussions is an essential objective of the course. *Prep. admission to hospital pharmacy program.*

Yearly, Summer Quarter

71.823 Legal Aspects/Federal Legislation in Pharmacy (2 q.h.)

An analysis of the Federal and state laws relating to the distribution of drugs in the institution. Included are common law liabilities such as malpractice and other frequently encountered problems. *Prep. admission to hospital pharmacy program.* Yearly, Fall Quarter

71.844 Hospital Pharmacy Administration (2 q.h.)

Administration of the pharmacy department in an institutional environment. Study of budgets, purchasing, and distribution procedures. Medium-scale production of preparations for dispensing. Personnel management, public relations, legal responsibilities, educational demands, professional communications, and general administrative function of a hospital pharmacist. *Prep. admission to hospital pharmacy program or consent of instructor.* Alternate Years, Fall Quarter

71.845 Hospital Pharmacy Administration II (2 q.h.)

A continuation of 71.844 Hospital Pharmacy Administration I. *Prep. 71.844.* Alternate Years, Winter Quarter

71.846 Hospital Pharmacy Administration III (2 q.h.)

A continuation of 71.845 Hospital Pharmacy Administration II. *Prep. 71.845.* Alternate Years, Spring Quarter

71.852 Health Care Administration I (2 q.h.)

The socio-economics and statistics of health care, including governmental programs, legislative trends, third-party insurance and welfare programs, and other areas that may affect the management of the modern institutional pharmacy. *Prep. admission to the hospital pharmacy program or consent of instructor.* Alternate Years, Fall Quarter

71.853 Health Care Administration II (2 q.h.)

A continuation of 71.852 Health Care Administration I. *Prep. 71.852.* Alternate Years, Winter Quarter

71.854 Clinical Pharmacy (2 q.h.)

The patient-oriented aspects of the application of therapeutic agents to hospital patients. An in-depth study of the relation of therapeutic regimens to laboratory tests and drug interactions. The role of the hospital pharmacist as an active member of the actual health-care team dealing directly with in-patients and out-patients. *Prep. admission to hospital pharmacy program or consent of instructor.* Alternate Years, Fall Quarter

71.855 Human Relations

A study of personnel psychology, organization structuring, wage and performance incentives, employee evaluations, and policy in relation to accepted personnel concepts and procedures. *Prep. admission to hospital pharmacy program or consent of instructor.* Alternate Years, Spring Quarter

71.856 Data Processing (2 q.h.)

Theory and capabilities of major data-processing systems. The practical application of these systems to institutional pharmacy practice. *Prep. admission to hospital pharmacy program or consent of instructor.* Yearly, Winter Quarter

71.858 Contemporary Therapeutics I (2 q.h.)

Recent developments in current therapeutic approaches and their rationale in the treatment of cardiovascular, neurological, gastrointestinal, musculoskeletal, and metabolic diseases of a noninfectious nature. Therapy related to aging and selected genetic diseases. *Prep. 71.854.* Alternate Years, Winter Quarter

71.859 Contemporary Therapeutics II (2 q.h.)

Current concepts of infectious diseases and the rationale for the chemotherapeutic treatment of these conditions. Diseases of the blood and blood-forming organs, neoplastic disease, and diseases related to deficiency states. *Prep. 71.854.* Alternate Years, Spring Quarter

71.860 Drug Monitoring (2 q.h.)

The process by which drugs are monitored to determine their effectiveness, safety, prevention of iatrogenic factors, drug-drug interactions, and matters affecting patient compliance with a therapeutic regimen. The utilization of this information in improving patient care. *Prep. 71.854.* Alternate Years, Fall Quarter

71.861 Sterile Products (2 q.h.)

Theory, principles, methods, and techniques in preparing sterile, pyrogen- and particulate-free products. Equipment and laboratory design required for manufacturing different types of sterile products and the practical considerations essential for their production. *Prep. Microbiology.* Alternate Years, Winter Quarter

71.862 Hospital Preparations (2 q.h.)

Therapeutic concepts, pharmaceutical problems, and methods of preparing various specialized clinical preparations and mixtures. These include: hyperalimentation solutions, dialysis solutions, cationic or anionic adjustment solutions, irrigation solutions, pediatric preparations, reconstitution preparations, additive admixtures, and unit dose packaging. *Prep. admission to hospital pharmacy program.* Alternate Years, Spring Quarter

71.863 Clinical Problem Solving (2 q.h.)

A consideration of problems which the hospital pharmacist encounters in providing pharmaceutical service to the health-care professions. The

problem-solving approach to resolving difficulties is studied. Special project problems may be assigned on topics requiring current solutions. This includes an examination of the problem-solving approach and its application to the pharmacist's resolution of those situations stemming from his position in a clinical setting. *Prep. admission to hospital pharmacy program.*

Yearly, Spring Quarter

72.812 Advanced Drug Synthesis (3 q.h.)

Application of synthetic and analytical techniques to the formation of new drugs. *Prep. two quarters of Organic Chemistry with laboratory.*

Alternate Years, Winter Quarter

72.834 Clinical Chemistry I (2 q.h.)

Principles, instrumentation, methodologies, and interpretations in clinical chemistry. *Prep. 90.823.*

Yearly, Fall Quarter

72.835 Clinical Chemistry II (2 q.h.)

A continuation of Clinical Chemistry I. *Prep. 72.834.*

Yearly, Winter Quarter

72.836 Special Topics in Clinical Chemistry (2 q.h.)

Recent advances and techniques in clinical chemistry. *Prep. 72.835.*

Yearly, Spring Quarter

72.837 Seminar and Report in Clinical Chemistry (2-6 q.h.)

Reports and discussions of current journal articles in clinical chemistry. *Prep. 72.835.*

Yearly, Winter Quarter

72.840 Nuclear Medicine I (2 q.h.)

An introduction to the physical aspects of nuclear medicine. Discussion of the various instruments used in clinical nuclear medicine, such as scintillation cameras and scanners, probes, whole body counters, and the new proportional wire detectors. The effect of collimation is considered with each type of instrument. Also included are tracer methodology and radiation dosimetry. *Prep. 11.871, 12.807.*

Alternate Years, Fall Quarter

72.841 Nuclear Medicine II (2 q.h.)

A consideration of the chemical and biological aspects of nuclear medicine. Discussion of the methods of radiopharmaceutical drug preparation and quality control. Topics covered include: parent-daughter pairs, radionuclide generators, activation analysis, and cyclotron products. An examination of radioindicators used for organ imaging, disease specific radiotracers, the use of radioimmunoassay and competitive binding assays, and therapeutic radioactive compounds. *Prep. 72.840.*

Alternate Years, Winter Quarter

72.842 Radioisotopic Instrumentation (2 q.h.)

Lectures and laboratory demonstrations on current instrumentation

systems for radioisotopic analysis. Manual and automated gamma and liquid scintillation detectors and radioautography, as well as solid-state detectors. This course discusses, in a practical way, the theoretical material presented in 72.840. *Prep. 11.871, 12.807.*

Alternate Years, Fall Quarter

72.843 Radioisotopic Application (2 q.h.)

Demonstrations and discussions of the preparation and quality control of radiopharmaceuticals from reactor, generator, and cyclotron radionuclides. Assay techniques for radiochemical, radionuclide, and chemical purity; legalistic implications of the handling and dispensing of radioactive drugs. This is a companion course to 72.841. *Prep. 72.840, 72.842.*

Alternate Years, Winter Quarter

72.844 Seminar and Research Report in Radiopharmaceutical Science (2. q.h.)

Seminar and research report in radiopharmaceutical science. Familiarization with and review of the latest literature in radiopharmaceutical science. Organization of material in a particular area and presentation in written form as a coherent entity is required. *Prep. consent of instructor.*

Alternate Years, Spring Quarter

72.861 CNS Depressants (2 q.h.)

Presentation and discussion of the chemistry, structure-activity relationships, and mechanism of action of general anesthetics, hypnotics and sedatives, antiepileptics, analgetics, tranquilizers, and muscle relaxants. A consideration of the mechanics of drug design and methods of modification is undertaken. *Prep. two quarters of Organic Chemistry.*

Alternate Years, Spring Quarter

72.862 Autonomic Drugs (2 q.h.)

A discussion of drugs acting on the central nervous system, with special emphasis on the action mechanism of the chemical mediators of the peripheral nervous system. The role of the agents affecting this system—adrenergic and cholinergic and reversible and irreversible inhibitors of these systems—is discussed in relation to their chemical structure and biological activity. *Prep. two quarters of Organic Chemistry.*

Alternate Years, Winter Quarter

72.863 Anti-infectives (2 q.h.)

A study of the various chemotherapeutic agents employed in the treatment of infectious diseases. Included are: the sulfonamides, antibiotics, antivirals; antitubercular, antifungal, and antimalarial agents. Special emphasis is on structure-activity relationships, mechanisms of action, and modern research in each area. *Prep. two quarters of Organic Chemistry.*

Alternate Years, Fall Quarter

72.864 Cancer Therapy and Carcinogenesis (2 q.h.)

Recent developments in new approaches to both carcinogenesis and to

the treatment of cancer are considered, including alkylating agents, antimetabolites, hormones, miscellaneous compounds, and combinations of the above with radiation and immunology. Possible mechanisms of carcinogenesis and chemotherapeutic action explored. *Prep. two quarters of Organic Chemistry.* Alternate Years, Spring Quarter

72.865 Special Topics in Medicinal Chemistry (2 q.h.)

A consideration of a special area of medicinal chemistry, including either steroids, CNS compounds, pharmacodynamic agents or chemotherapeutics; their chemistry and structure. *Prep. two quarters of Organic Chemistry.* Alternate Years, Summer Quarter

72.866 Phytochemistry (2 q.h.)

The important classes of chemical compounds produced by plants considered from the standpoint of their biogenetic origin, detection, isolation, and characterization. Application of these techniques to research in pharmacy, medicine, economics, botany, taxonomy. Introduction to the literature of plant chemistry. *Prep. two quarters of Organic Chemistry and two quarters of Biology.*

Alternate Years, Fall Quarter

72.867 Medicinal Chemistry Seminar (2 q.h.)

Selection and discussion of pertinent articles in the very recent medicinal chemistry literature carried out by faculty and students. Background and the basis for this research discussed. *Prep. two quarters of Organic Chemistry.* Yearly, Summer Quarter

73.814 Concepts in Pharmacology I (2 q.h.)

Selected areas of pharmacology are examined in depth, with special reference to interactions of drugs and other chemical agents with biological systems. Emphasis on biochemical mechanisms, experimental design, evaluation of data using conventional statistical procedures, and techniques employed in pharmacological evaluations. *Prep. permission of instructor.* Yearly, Fall Quarter

73.815 Concepts in Pharmacology II (2 q.h.)

Continuation of Concepts in Pharmacology I. *Prep. 73.814.*

Yearly, Winter Quarter

73.816 Concepts in Toxicology I (2 q.h.)

Concepts of modern toxicology in which emphasis is placed on biochemical mechanisms underlying the toxicological action of drugs and other chemical substances upon biological systems. Selected topics in toxicology, including acute, subacute, and chronic effects of drugs in the experimental animal and man. Consideration of the predictive value of animal studies for drug effects in man. *Prep. consent of instructor.* Yearly, Fall Quarter

73.817 Concepts in Toxicology II (2 q.h.)Continuation of Concepts in Toxicology I. *Prep. 73.816.*

Yearly, Winter Quarter

73.818 Special Topics in Pharmacology (2 q.h.)Concepts and current research activity in a variety of areas, including autonomic, renal, cardiovascular, and endocrine pharmacology; chemotherapy; blood; and pharmacological aspects of immunity and allergy. *Prep. 73.815.*

Alternate Years, Spring Quarter

73.822 Pathology (2 q.h.)The student is introduced to the study of the nature of disease, emphasizing the general mechanisms and pathogenesis. Of paramount importance is the effect of disease on the human body. The language of disease is stressed. Basic principles of disease processes and more common special diseases covered extensively. A research paper may be assigned at the discretion of the instructor. *Prep. Anatomy and Physiology.*

Yearly, Spring Quarter

73.844 Drug Metabolism (2 q.h.)Presentation and detoxification mechanisms relating to drug metabolism and excretion patterns; adaptive factors influencing metabolism. *Prep. 90.821.*

Yearly, Winter Quarter

73.845 Radioisotopes in Biological Systems (2 q.h.)Methodology of radioactive nuclides and application of these isotopes to biology and medicine, with special emphasis on their use in clinical analysis. *Prep. consent of instructor.*

Yearly, Spring Quarter

87.801 Advanced Medical Laboratory Science—Pathogenic Microbiology (4 q.h.)Methods of identification and differentiation of normal and pathogenic body flora. Sensitivity and the antimicrobial drugs. Students participate in some lectures given in 87.201. Assigned individual work on specialized aspects of pathogenic microbiology. *Prep. 18.220, 87.101, or equivalent.*

Yearly, Spring Quarter

87.802 Advanced Medical Laboratory Science—Hematology and Immunohematology (4 q.h.)Morphology and physiology of blood cells and bone marrow in health and disease. Ultrastructure of the blood cells and platelets. Isoimmunization and sensitization. Students participate in some lectures given in 87.202. Assigned individual work on specialized aspects of hematology and immunohematology. *Prep. 87.101, 87.102, or equivalents.*

Yearly, Fall Quarter

87.803 Medical Immunology and Serology (2 q.h.)

Medically applied immunological and serological concepts and pro-

cedures. Students may participate in some lectures given in 8.203 Assigned individual work on specialized aspects of medical immunology and serology. *Prep. 18.220.*

87.804 Medical Parasitology (2 q.h.)

Laboratory identification of human parasites and a study of their life cycles. Students may participate in some lectures given in 87.204 Assigned individual work on specialized aspects of medical parasitology. *Prep. 18.220.*

87.805 Advanced Medical Laboratory Science—Chemistry and Instrumentation (4 q.h.)

Clinical chemistry in the assessment of human physiology in health and disease. Students participate in some lectures given in 87.205 Assigned individual work on specialized aspects of clinical chemistry *Prep. 87.801, 12.171, 12.145, 87.105, or equivalent.* Yearly, Winter Quarter

87.807 Biometrics

Statistical methods applied to biological samples and analysis of biological research data. (Note: This course is similar to 18.803 previously available through the Biology Department.) *Prep. 18.121 or equivalent.* Yearly, Fall Quarter

87.810 Functions of the Human Systems (2 q.h.)

Histology and physiology of respiratory, urogenital, endocrine, nervous and digestive systems. Lectures supplemented by current research articles and student reports. Fall Quarter

87.811 Pathophysiology I (2 q.h.)

The nature of the disease process and the use of the laboratory in defining the disease mechanisms. *Prep. 87.201, 87.202, 87.205 87.810, or equivalents.* Yearly, Winter Quarter

87.812 Pathophysiology II (2 q.h.)

The interpretation of laboratory tests in medicine. *Prep. 87.811.* Yearly, Spring Quarter

87.821 Medical Laboratory Management (2 q.h.)

Management principles, including supervision, communication, laboratory staffing, personnel management, staff evaluation and education. Professional ethics, relationships, and legal responsibilities. Individual research included. *Prep. 87.811, 87.812, 87.815, or consent of instructor.* Winter Quarter

87.822 Medical Laboratory Management II (2 q.h.)

Laboratory operational principles, including laboratory safety, use of quality control and automated evaluation systems, laboratory economics, administration, and purchasing. Individual research included. *Prep. 87.821.* Spring Quarter

87.823 Immunohematology (2 q.h.)

Blood bank problem solving: i.e., antibody identification and transfusion reactions. Medical and legal aspects of blood banking. *Prep. 87.202 or 87.802; 87.812.*

87.826 Health Science Education I (2 q.h.)

Educational objectives, evaluation methods, and use of multi-media and other innovative methods. *Prep. 87.811, 87.812, 87.815.* Fall Quarter

87.827 Health Science Education II (2 q.h.)

Current trends in curriculum design, laboratory education, and development of autotutorials. Course includes individual research. *Prep. 87.811, 87.812, 87.815.* Winter Quarter

87.828 Health Science Education III (2 q.h.)

The application and evaluation of new and existing teaching methods in medical laboratory science education. Required participation in course instruction. *Prep. 87.811, 87.812, 87.815.* Spring Quarter

87.832 Hematology I—Disorders of the Erythrocytes (2 q.h.)

The pathophysiology of red cell disorders. Clinical and laboratory correlations of the anemias and polycythemias. *Prep. 87.202 or 87.802 and 87.112.*

87.833 Immunobiology (2 q.h.)

Lectures include topics of current interest in immunobiology, such as organ transplantation, immune tolerance, enhancing and blocking factors, and the immunology of cancer. *Prep. consent of instructor.* Yearly, Spring Quarter

87.843 Immunobiology Laboratory (2 q.h.)

Students are required to undertake individual research projects relating to topics covered in lecture. *Prep. consent of instructor.* Yearly, Spring Quarter

87.842 Hematology II—Disorders of the Leukocytes (2 q.h.)

The pathophysiology of white cell disorders. Clinical and laboratory correlations of leukemias, myeloproliferative and lymphoproliferative disorders, infections, and inherited leukocyte anomalies. *Prep. 87.202 or 87.802; 87.112.*

87.845 Epidemiology (2 q.h.)

Basic concepts of epidemiology, causes of disease, factors contributed by agents, the human host, and the environment. Acquisition and evaluation of data. Relationship of person, time, and place. Case studies and problems. *Yearly, Winter Quarter*

87.852 Hematology III—Coagulation (2 q.h.)

Clinical and laboratory correlations of coagulation disorders. The use of factor analysis in diagnosis of coagulation disorders. *Prep. 87.202 or 87.802; 87.812.*

87.858 Cellular Pathology (2 q.h.)

Control mechanisms, with emphasis on cancer and other cellular abnormalities. *Prep. 18.227 or consent of instructor.*

87.890 Seminar (1 q.h.)

Topics to be announced quarterly.

87.990 Graduate Research Report I (2 q.h.)

Research of a special topic in medical laboratory science involving individual research is undertaken and reported. Under the direction of a faculty member. Yearly, Summer, Fall, Winter, and Spring Quarters

87.991 Graduate Research Report II (2-6 q.h.)

Continuation of 87.990. *Prep. 87.990.*

Yearly, Summer, Fall, Winter and Spring Quarters

90.821 Biochemistry I (2 q.h.)

Description of the components of biochemistry, including the chemistry of carbohydrates, lipids, prostaglandins, steroid hormones, amino acids, polypeptides, proteins, purines, pyrimidines, nucleosides, and nucleic acids. Consideration of Henderson-Hasselbalch expression, buffers, and importance of pKa. *Prep. two quarters of Organic Chemistry.*

Yearly, Fall Quarter

90.822 Biochemistry II (2 q.h.)

Discussion of enzymes, enzyme kinetics, and mechanisms of enzyme reactions. An introduction to the methods used for intermediary metabolism, bioenergetics, biological oxidation-reduction reactions, and the electron transport chain. A consideration is made of carbohydrate metabolism, including the citric acid cycle, the Embden Meyerhoff pathway, and the pentose phosphate pathway. Use of isotopes in biochemistry and the role of high-energy phosphate compounds are outlined. *Prep. 90.821.*

Yearly, Winter Quarter

90.823 Biochemistry III (2 q.h.)

Lipid metabolism is presented, including the fatty acid cycle, the biosynthesis of fatty acids, and the biological formation of the prostaglandins, cholesterol, and steroid hormones. The metabolism of the various amino acids is considered, including the urea cycle, one-carbon fragments, transamination reactions, and aromatic hydroxylations. Metabolism of nucleic acids and their building blocks are discussed, as well as the genetic basis of protein synthesis, the genetic code, and the mechanisms of control. *Prep. 90.822.*

Yearly, Spring Quarter

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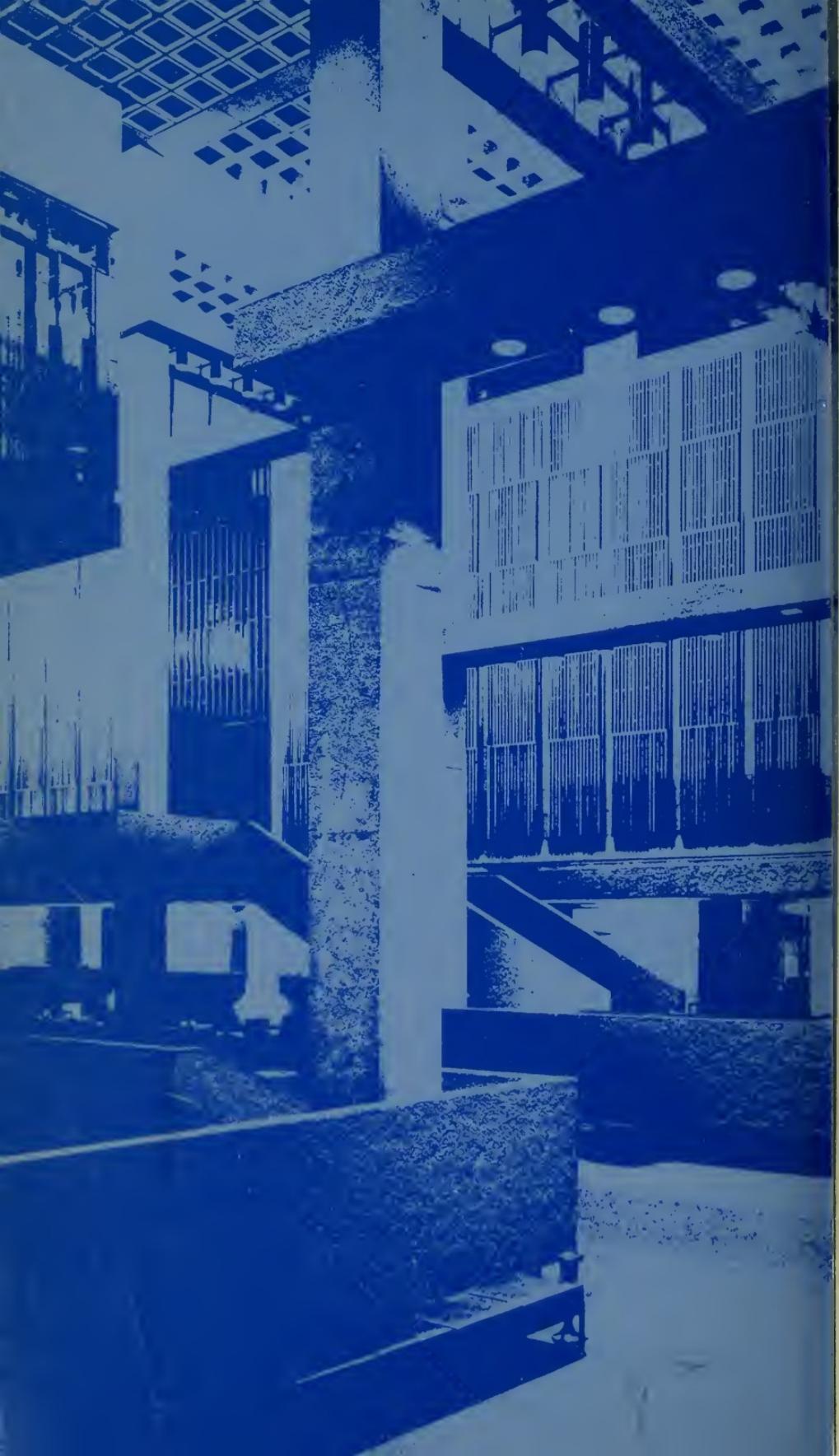
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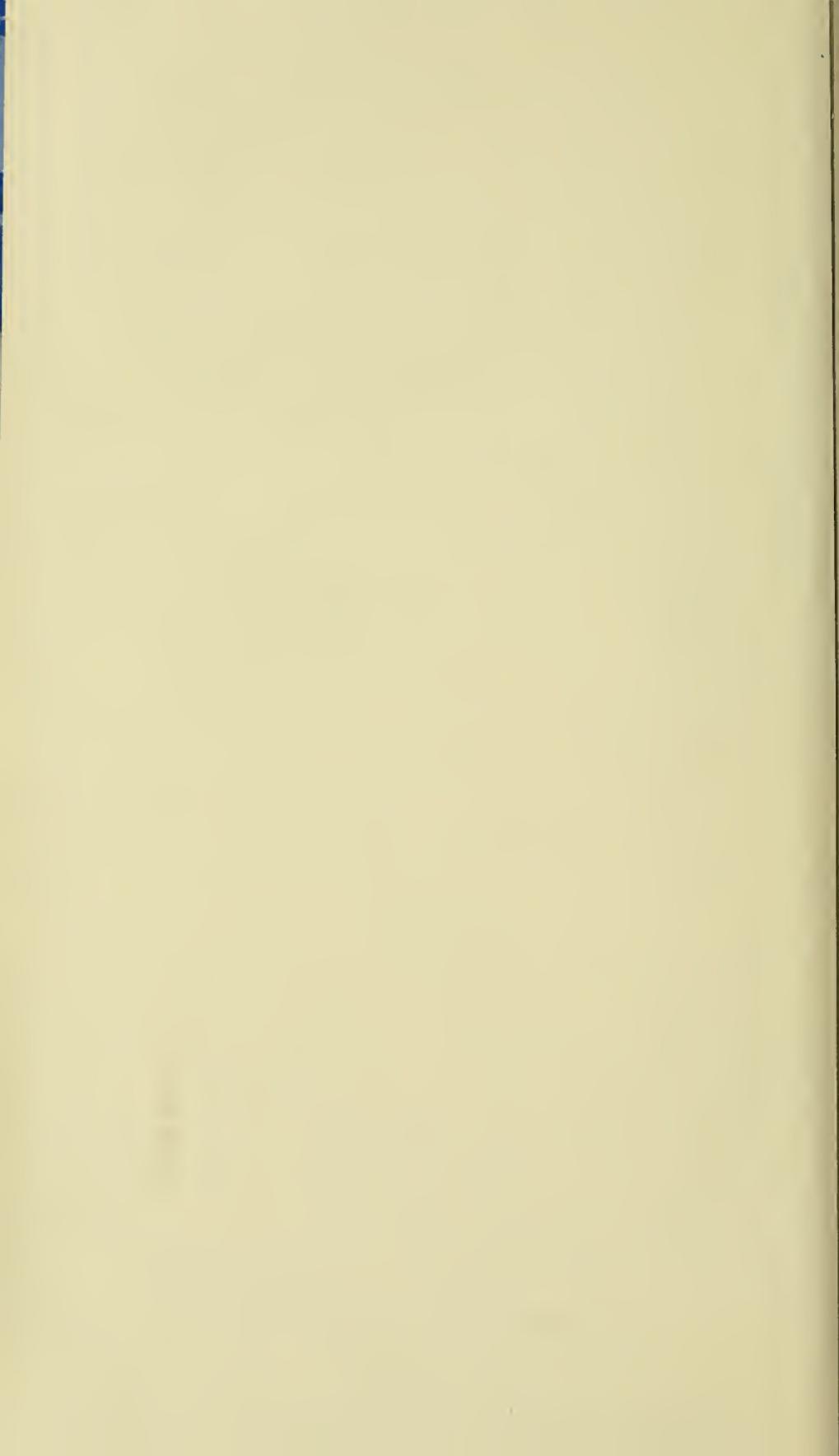
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